

# AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

APRIL 1, 1940



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Forged and scientifically treated for control of the unseen elements that effect endurance—precision built at every step, with exact control of the visible and measurable, New Departure Ball Bearings offer performance ability that is uniformly of the highest order.

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**THE FORGED STEEL BEARING**

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It just goes to show, *you never can tell*—until you call in a Standard Lubrication Engineer.

You reach these men through your local Standard Oil office, or by writing 910 S. Michigan Avenue, Chicago, Illinois.

Copy. 1910, Standard Oil Co. (Ind.)

# ACME CUTTING OIL

## STANDARD OIL COMPANY (INDIANA)



# AUTOMOTIVE INDUSTRIES

## THE AUTOMOBILE

Reg. U. S. Pat. Off.  
Published Semi-Monthly

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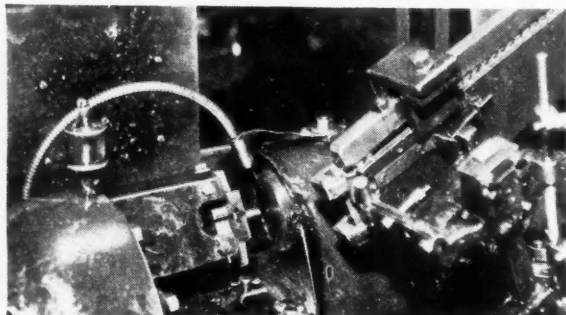
The engineering staff of the Young Radiator Company is available without any obligation for consultation concerning your cooling requirements.

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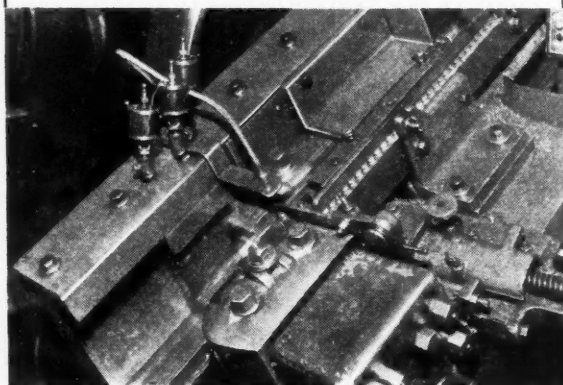
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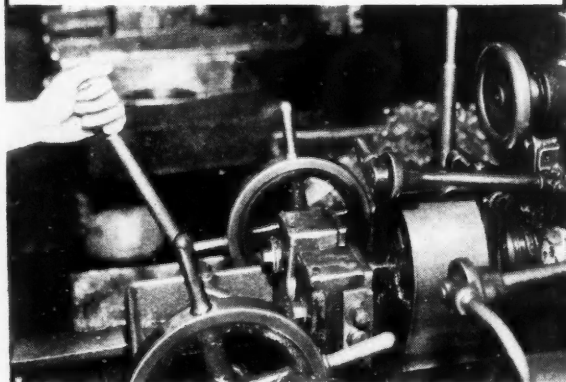
# ALL THIS FROM A CUTTING OIL



**HOLLOW MILLING AND THREADING** in an Economy Automatic Threading Machine. The bolts are S.A.E. 3135 and 1035 steel. The Texaco Lubrication Engineer saved 25% of the cost of cutting oil by expert handling.



**THREAD ROLLING** operation on which the Texaco Engineer showed a 40% increase in die life. Better finish was another result of using *Texaco Sultex*.



**THREADING S. A. E. T-1335 BOLTS** in this Landis Threading Machine showed better finish and increased die life; as a result of *Texaco Sultex*.

- IF 25% SAVING**
- IF LONGER TOOL-LIFE**
- IF BETTER FINISH**

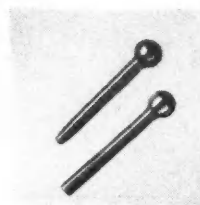
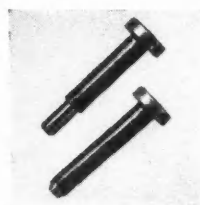
SO RUNS the engineer's report of cutting oil performance where the accompanying pictures were taken.

These improvements were made as the result of finding more suitable cutting oils, expertly selected and applied.

The brand used here is *TEXACO SULTEX Cutting Oil*. The Texas Company offers you the opportunity of achieving similar results . . . in *your* plant.

At any rate, it's well worth finding out about. To do so, phone the nearest of more than 2300 warehousing points, or write direct to:

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**TYPICAL PARTS** machined in a well-known Muncie, Ind., shop. Longer tool-life, better finish and a direct saving of 25% is reported as a result of using *Texaco Cutting Oils*.

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# TEXACO SULTEX

**CUTTING AND  
SOLUBLE OILS**



# IN THIS ISSUE . . .

## AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.  
Volume 82 April 1, 1940 Number 7

**S**ENATOR JOSEPH C. O'MAHONEY, who as chairman of the Temporary National Economic Committee will preside at hearings when the committee takes up the subject of technological developments on or about April 8, has introduced a bill in Congress to tax the machine although he describes it as a plan to "balance men and machines" and to relieve unemployment by rewarding employers with credits on tax payments for providing jobs.

The measure, according to the Senator, is proposed on the theory that "the machine could be made to pay its way in terms of human production in such a manner that society would receive the maximum benefits from the full enjoyment of both."

Designed to place a "labor differential tax" on all products, the bill would amend the Internal Revenue Code. Labor differential income is designated as the gross income as defined in Section 22a of the code, less the deductions proposed to be allowed in the bill. In computing labor differential income, the producer under the terms of the bill would be allowed these deductions:

1. The total cost of materials and supplies purchased and used during the taxable year in carrying on production.

2. The total amount of remuneration up to \$3,000 paid as salary or wages for personal services to any worker.

A companion bill has been introduced in the House, where all tax legislation most originate, by Representative Charles H. Leavy, Democrat of Washington.

Introduction of the O'Mahoney bill prompted Senator George W. Norris, Independent of Nebraska, to remark that "we ought to hesitate long—I think forever, unless there is a real compulsion under conditions that we cannot resist—before we try to put a stop sign on the road of human progress, or to levy a tax upon the improvement of any machinery . . ." The Senator said he was fearful that the O'Mahoney bill would have a tendency to do just that.

Said Senator O'Mahoney:

"I would be the last person to attempt to raise a stop sign on the road of technological improvement . . . the machine has been the cause of most of our improvement . . . but I believe that this measure contains a formula which will make it possible for us to balance men and machines, and to get the best possible result out of both."

(See page 331)

### GENERAL

#### The Industry's Issues—

Page

307

Never in the history of the industry have so many points of importance been in the forefront nor any more capable of making or breaking the future welfare of the industry. In this article Herbert Hosking discusses the potent features of some of them.

### PRODUCTION

#### Twin Disc Products Held to Rigid Specifications 310

In the first issue of each month AUTOMOTIVE INDUSTRIES has described the production methods and equipment of some outstanding plant. Recently Joseph Geschelin visited the Twin Disc Clutch Co. and made an exhaustive study of their methods and routine. Here is the result of that visit. From it one may learn of methods that might be adopted or adjusted to other products or conditions.

### AERO DESIGN

#### Small Plane Production Climbed in '39 320

At the S. A. E. National Aeronautic Meeting the past, present and future of aircraft were discussed with a wide range of pros and cons. P. M. Heldt has written an account of the meeting, discussing the real "meat" of the material presented.

### TESTING

#### Performance Test is the Only Adequate Gage of Diesel Lubricants 332

The Surface Transportation Corp. of New York City has evolved a unique method of testing that is described in this article.

#### Business in Brief 309

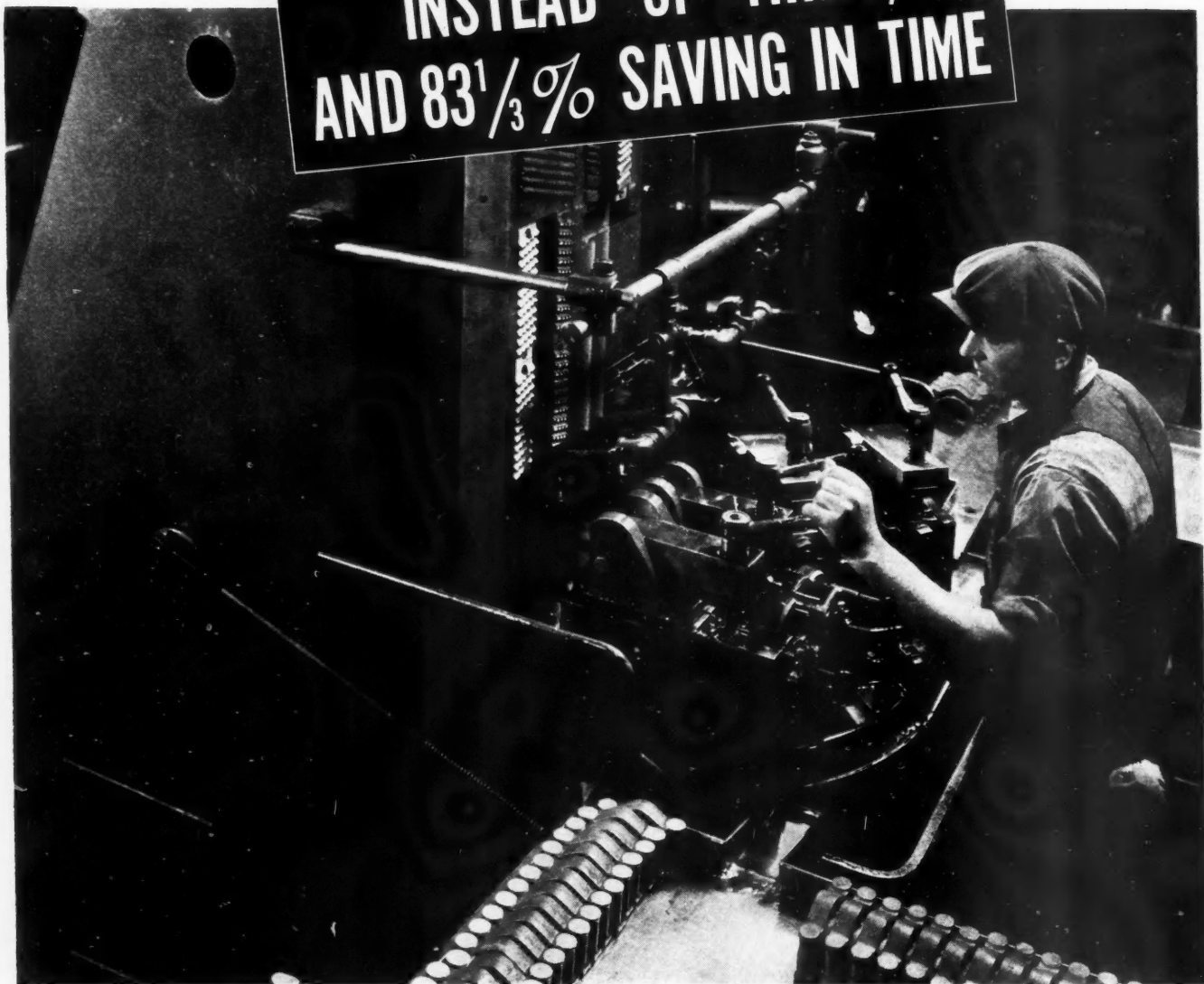
#### Men and Machines 328

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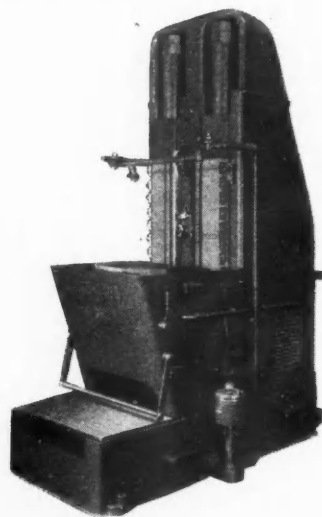
Since 1913 all issues of AUTOMOTIVE INDUSTRIES have been indexed in the *Industrial Arts Index*, which can be consulted in any public library.

**NOW ONLY ONE HANDLING  
INSTEAD OF THREE,  
AND 83 $\frac{1}{3}$ % SAVING IN TIME**



**H**ERE'S a real-life incident of shop production that rivals the "before" and "after" placards of the old-time medicine shows. In a well-known motor coach body building plant, three different machines were doing three machining operations on bearing caps. Production averaged only about 10 caps per hour. Something had to be done about this excessive cost, and a CINCINNATI No. 5-54 Duplex Vertical Hydro-Broach reduced it in a big way. This machine now handles all three operations, broaching six caps in the time formerly required for one.

One of the features that makes possible this remarkable saving is the exclusive index table. It provides almost continuous production, the part in one station being broached while the other station is unloaded and loaded. Hardened ways for the rams and automatic lubrication add considerably to the machine life span. Other features are listed in circular M-842. Write for your copy today.



## **THE CINCINNATI MILLING MACHINE CO. CINCINNATI GRINDERS INCORPORATED**

Manufacturers of

Tool Room and Manufacturing Milling Machines  
Surface Broaching Machines    Centertype Grinding Machines    Cutter Sharpening Machines  
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# AUTOMOTIVE INDUSTRIES

Published on the 1st  
and 15th of the month

Vol. 82, No. 7  
April 1, 1940

## The Industry's Issues . .

***Continue to center in Washington as F. T. C. finalizes hearings on proposed code. New warranties crop up in the marketing picture***

**I**T TOOK just three hours on March 20 for the Federal Trade Commission to hear final verbal views on the proposed Fair Trade Practice Rules for the Automobile Industry. As you read this, final briefs will have been filed with the Commission. Friends of the rules have found that they did not love them in December as they did in May. Underneath the elaborate rationalizations

By HERBERT HOSKING

of those who now oppose the rules "in their present form," there is a current of general distaste for any form of Federal control of the automobile industry. When the dealer referendum on Federal legislation is counted, it is likely that the vote will be overwhelmingly opposed to Federal control in any form.

The events of the last two weeks have convinced us that the proposed FTC code is likely to become "pickled" in procedure to such a point that a year or so from now people will be asking: "What's happened to the proposal for a FTC code for the automobile industry?"

A great deal of useful information bearing on the industry has come out of the FTC studies leading to the writing of the proposed code. The Automobile Manufacturers Association has placed on the record its willingness to cooperate in further studies for beneficial ends. In these two facts, and not in an emasculated code, lies the real hope of the automobile dealers for a perfected operating structure.

### ***Bigger and Better Warranty***

The "standard warranty" of the automobile industry, which for nearly a decade has failed to reflect the excellence and durability of motor-vehicle design, seems destined to the scrap heap so far as its present form is concerned. Sometime before the beginning of this year, the Diamond T Motor Car Co. decided that



Donald Richberg, appearing as special counsel for the National Automobile Dealers Association, told an F.T.C. hearing that dealers were opposed to the suggested Fair Trade Practice Code for the automobile industry in its present draft. See story on p. 337.



it could guarantee its trucks against defects in workmanship and material for a period of one year, or 100,000 miles of operation, whichever should elapse first. This move did not create any great splash within the industry, because everyone took it for granted that everyone's products could meet such a warranty. Other truck manufacturers adopted the "so what?" attitude, and those who were in direct competition with the Diamond T line prepared to meet the competitive advantage which the new warranty would give with ingenious, but rhetorical arguments.

All that is changed now. Another truck manufacturer, an engine manufacturer, and a passenger car manufacturer have climbed on the band wagon. Willys puts the warranty period at three years or 100,000 miles, which, placing the average yearly mileage at 12,000 would make the average Willys warranty expire somewhere around 36,000 miles.

There seems little reason to doubt that before very long most of the warranties in the industry will be on a 100,000-mile basis, where mileage is a significant factor. Until this position is legitimized by collective action of the Automobile Manufacturers Association there is also the chance that a number of gaudy extra claims will find their way onto the competitive situation.

Manufacturers have little to lose in making the warranty match performance possibilities. Dealers and dealer service organizations favor the move because it becomes a talking point on both new and used car sales, and because it removes the source of a good many minor wrangles with the factory on the subject of replacing parts which have exhibited their defects beyond the present warranty period.

Users of motor vehicles will benefit from a longer warranty and some of them will undoubtedly show their appreciation by attempting to chisel more service and replacements than they deserve in equity.

A 100,000-mile warranty will probably also stimulate more rental plans for private passenger cars because it provides a more solid basis on which to calculate rental costs.

Summarized, the

move toward extended warranties seems a beneficial one for the industry as a whole, which will find few objectors.

### **Interstate Barriers Grow**

The movement of motor trucks across state boundaries resembles a vast chess game, with constantly changing rules. The single truck attempting to move through any appreciable distance is checked here or captured there, or must retreat in the face of taxation, special equipment requirements, or simple obstruction. As for 1940, the police power of the state finds its most uninhibited expression in legislating rules for the size, shape, weight, and even the color, of trucks on the highway. Spoilage of cargoes, obstruction of commerce and other undesirable by-products of such a game are pushed into the background. Rules whose faint excuse for existing is that they are designed to control irresponsible and predatory truck operators are made so drastic that even the best managed operations find it uneconomic to proceed in certain directions.

It may be worth while to recall that a hundred and fifty years ago, 13 jealous, impoverished, thinly populated former colonies of Great Britain banded together in a common adventure which has become very successful under the corporate name of the United States of America. Certain far-sighted early leaders of the enterprise foresaw that if the individual members were

permitted to hamper commerce of each other by taxation and restriction, there would be no economic survival for the group as a whole.

So important was this feeling that it found verbal expression in Article I of the Constitution of the United States.

Art. I, Sec. 9, IP 5: No Tax or Duty shall be laid on Articles exported from any State.

Art. I, Sec. 9, IP 6: No preference shall be given by any Regulation of Commerce or Revenue to the Ports of one State over those of another: Nor shall Vessels bound to, or from, one State, be obliged to enter, clear, or pay Duties in another.

Art. I, Sec 10, IP 3: "No State shall, (Turn to page 352)

### **The Brass-Hat Rack**



*"The Union's bargaining committee was just here!"*

## BUSINESS IN BRIEF

*Our own view of automotive production and sales;  
authoritative interpretation of general conditions*

**P**RODUCTION of motor cars and trucks continued to hold steady at a high level during the last half of March, indicating a probable output of 450,000 vehicles for the month which approximates the January production of 449,314 units. Preliminary estimates<sup>3</sup> for the week ending March 23 indicated approximately 109,500 units for that week and manufacturers' operations for the week ending March 30 were expected to maintain the same output.

March production was considerably higher than March, 1939, when 389,489 cars and trucks were manufactured in the U. S. and Canada, but it did not reach the total of 519,022 vehicles attained in March, 1937. March output also was ahead of the February total of 421,820 units, even though both months contained 21 working days. Several of the plants advanced to five-day production during March.

With March production, the first half of the 1940 model year was completed. An estimated 2,500,000 units can be credited to this six-month period. This compares to an output of 2,076,607 cars and trucks in the first half of the 1939 model year, an increase of 17 per cent for the 1940 models. An estimated total of 1,325,000 units was produced in the first three months of 1940 in comparison to 1,063,956 a year ago.

General Motors production held steady at better than 45,000 units for the week ending March 23. Chrysler divisions accounted for more than 24,500 cars and trucks, while Ford, resuming five-day production, had an output of nearly 24,000 units. Studebaker headed

the independents, followed closely by Packard, Hudson and Nash.

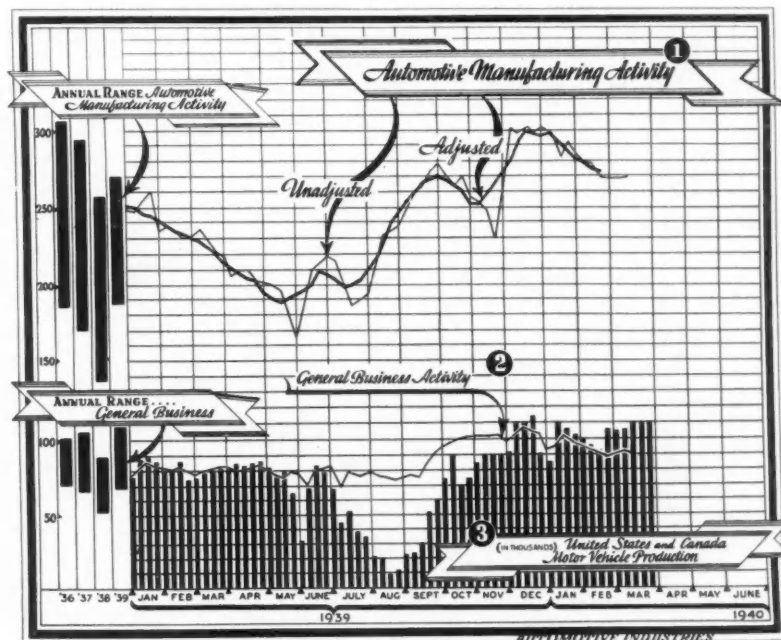
Steady production reflects the favorable sales reports from the companies. Chevrolet passed the 600,000 mark in production for 1940 models, with sales up 44 per cent for the first two months of the year. General Motors reported the best February domestic sales in its history. Buick factory shipments were 29 per cent above 1939 for March, while Oldsmobile and Pontiac retail sales were running considerably ahead of the comparable period of 1939.

Studebaker, Hudson and Willy reported a sales increase of 60 to 100 per cent ahead of 1939.

A 23-state survey of new car registrations by R. L. Polk & Co. indicated retail sales for February were 32 per cent above February, 1939.

Start of sub-assemblies by Graham-Paige Motors Corp. on a new car—named the "Hollywood" last summer when plans for the new line were drafted—was announced Mar. 23. Final assemblies were expected to be in production very soon. Three lines of passenger cars are contemplated in the present program: The Graham "Senior" in two price ranges, and the "Hollywood" and "Clipper" lines. First production cars will be the Senior and Hollywood lines, the Clipper only now receiving final engineering okay.

**AUTOMOTIVE MANUFACTURING ACTIVITY** steadied at the unadjusted index level of 268 and 269 for the weeks ended March 9 and March 16, respectively. Gradual decline of the adjusted curve charted herewith continued through the weeks ended February 17 and February 24 with the curve passing through the index points of 274 and 272.



**Weekly indexes of automotive general business  
charted**

## Production Firm at High Level

<sup>1</sup> 1923 average = 100; <sup>2</sup> Prepared by Administrative and Research Corp. New York. 1926 = 100; <sup>3</sup> Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

# Twin Disc Products Held

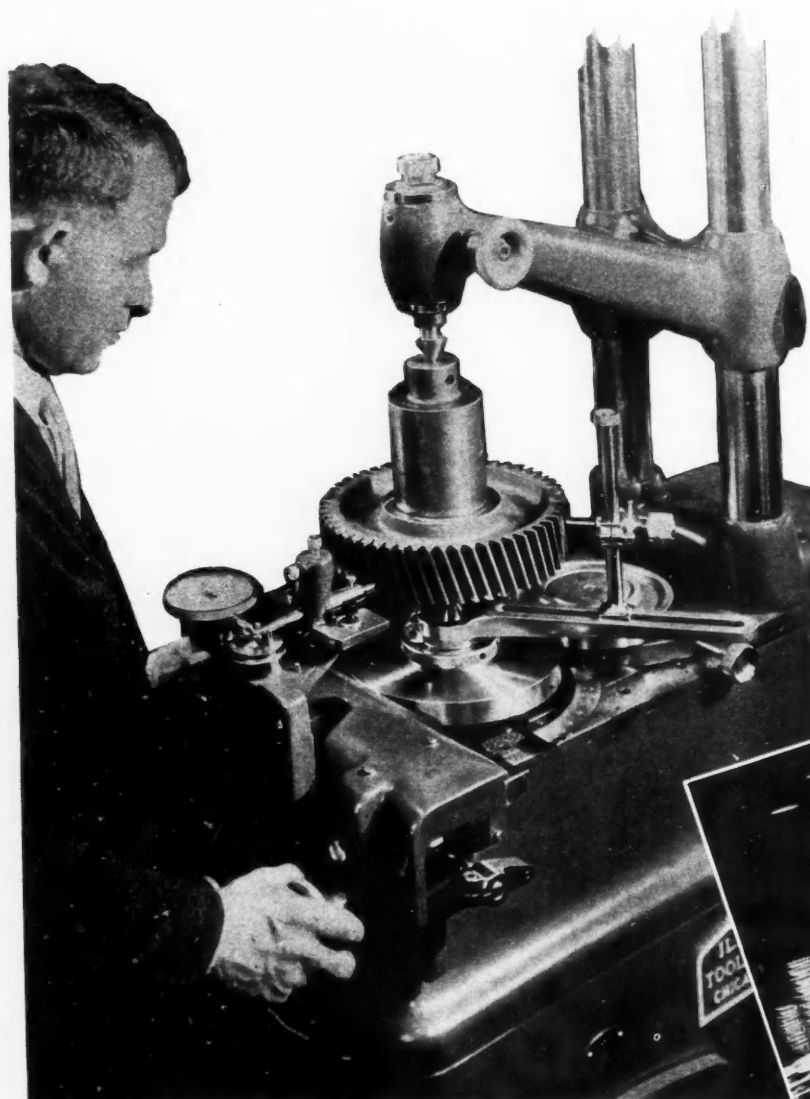
**F**OUNDED twenty-two years ago by P. H. Batten, industrialist, and engineer, who has remained at the helm as president through the years, the Twin Disc Clutch Co., Racine, Wis., is noted for its idealism of product design as exemplified in industrial clutches long-lived under gruelling service conditions, marine gear sets that seem never to wear out.

This company represents an interesting example of a successful automotive parts producer, serving the fertile fields of internal-combustion engine power utilization—industrial, agricultural, marine. Currently its line of products includes—six types of agricultural and industrial clutches in a full range of sizes; machine tool multiple-disc clutches of dry and oil types; close-coupled machine tool multiple-disc clutches of dry and oil types; complete industrial power take-off units, comprising the clutch, housing,

and power take-off quill; reduction gear units; marine reverse and reduction gear units ranging in capacity from 25 to 215 horsepower; various attachments; and more recently a line of fluid drives featuring the Twin-Disc hydraulic torque converter.

Serving some 700 different customers and producing a range of around 14,000 parts, the company shares in common the problem of many large parts makers—the economic management of a large variety of parts, some made in relatively large quantity, others in multiple-lot volume. For this reason, its operation is of unusual interest to everyone concerned with management and manufacturing.

Manufacturing is carried on in two plants—Racine, the headquarters, with 84,920 sq. ft. of productive floor space, and Rockford, with 49,890 sq. ft. of floor space. The Racine plant handles the fabrication and assembly of all large units, including the new hy-



*(Left) Part of the new precision gear manufacturing program is the Illinois Tool Co. involute gear checker shown here.*

*(Center below) Partial view of the battery of 24 Potter & Johnson heavy duty turret lathes in the Racine plant.*

*(Right) Viewing one of the machine shop bays in the Racine plant. In the foreground is the battery of special Fellows gear shapers—largest of their kind—with capacity for external gears up to 36 in. P.D., internals up to 43 in., P.D.*

*(Lower right) Due to quality requirements for heavy-duty service all shafts are ground all over. This view shows finish-grinding of power take-off shaft on a new Norton grinding machine.*





# to Rigid Specifications

draulic drive and marine gears, and in general, the production of special units and small-lot volume product. The Rockford division is essentially a mass-production set-up with specialized equipment of familiar types. Its principal product is clutches ranging up to 11½ inches in diameter for industrial and agricultural tractors. In addition, this plant makes clutches for power take-off units which are assembled in Racine. A certain percentage of such clutches also is built for outside customers for installation in special drives.

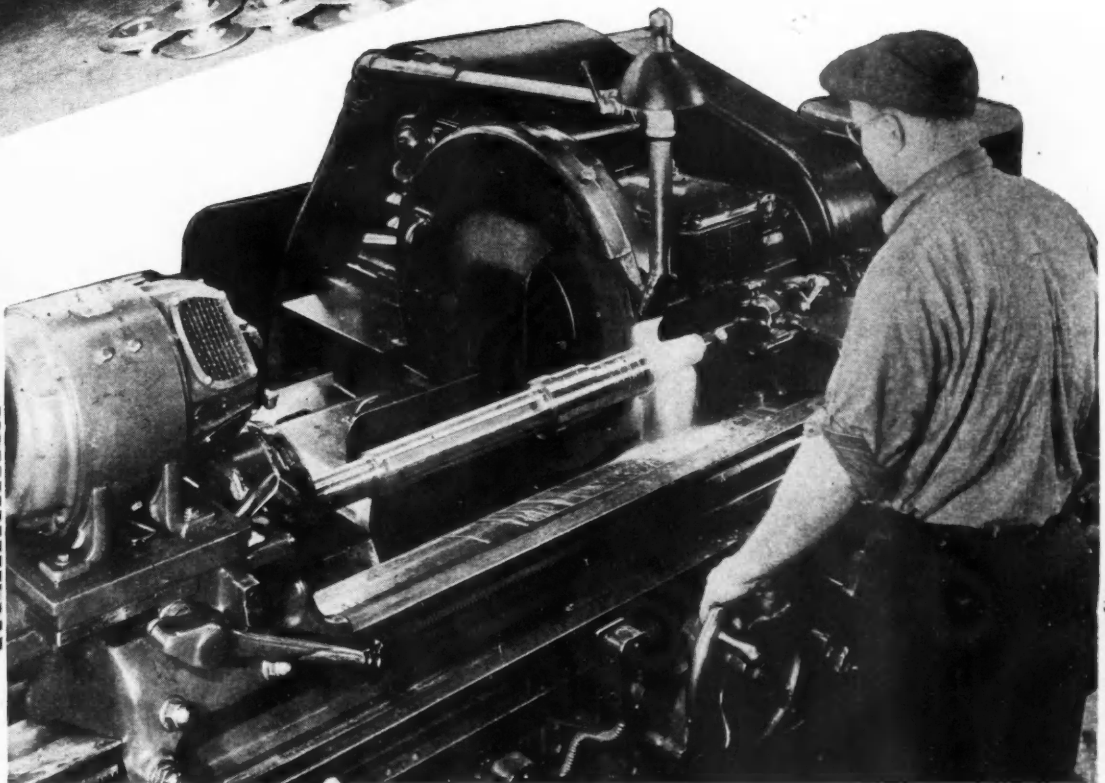
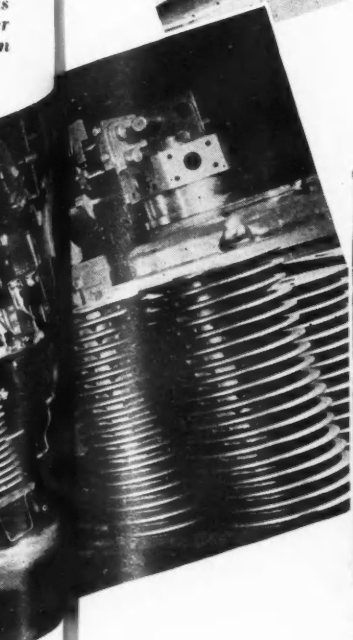
Some idea of the facilities at Rockford may be gained from the fact that it has a capacity of 350 clutches per eight-hour shift, boasts an inventory of \$200,000 of production machinery.

Realizing that heavy-duty requirements impose special emphasis upon good design, high-grade materials, and exceptional quality control, the organization pays particular attention to these characteristics. Here will be found a new set-up for producing quality gearing capable of long life in gruelling service. All gears are made of alloy steels, heat-treated, and shaved or ground after shaping or hobbing. Shafts are made of alloy steels, heat-treated. In general, all major parts are ground and in certain cases, finish-ground all over. In general, the parts that make up rotating elements are individually balanced on static-balancing machines.

Depending upon the nature of their duty, cast parts such as housings, clutch disk and hubs, etc., are made of high-grade gray iron, alloy cast irons, and electric



*This is the Forty-sixth  
in the series of monthly  
production features*



PRODUCTION

## Reduction Gear Main Shaft

### OPERATION AND EQUIPMENT

#### SAW

Hydraulic saw

#### FACE to length

Reed-Prentice engine lathe

#### CENTER DRILL

Whiton center drill

#### ROUGH TURN long end

Monarch Magna-Matic Z-14 in. lathe

#### FINISH TURN, undercut, and chamfer long end

Monarch Magna-Matic Z-14 in. lathe

#### ROUGH TURN short end

Monarch Magna-Matic Z-14 in. lathe

#### FINISH TURN, undercut, and chamfer short end

Monarch Magna-Matic Z-14 in. lathe

#### DRILL one 13/16 in. hole, bore and ream 1 1/4 in. and recenter

Warner & Swasey No. 2 turret lathe

#### DRILL, bore and ream 3/4 in. hole and recenter

Warner & Swasey No. 2 turret lathe

#### MILL keyway

Kempsmith miller

#### MILL 3 slots on long end

Kempsmith miller

#### MILL 3 slots on short end

Kempsmith miller

#### MILL keyway on long end

Kempsmith miller

### OPERATION AND EQUIPMENT

#### END MILL keyway on long end

Newton end miller

#### MILL keyway on short end

Kempsmith miller

#### END MILL keyway on short end

Newton end miller

#### MILL keyway

Kempsmith miller

#### THREAD

Landis thread mill

#### NUMBER

#### FILE burrs in assembly department

#### COPPER PLATE

#### TURN copperplating off gear diameter

Reed-Prentice engine lathe

#### FACE gear diameter

Reed-Prentice engine lathe

#### ROUGH CUT teeth

Barber-Colman Type A hobber No. 12

#### FINISH CUT teeth

Barber-Colman Type A hobber No. 12

#### DRILL 1/2 in. oil hole

Foot-Burt drill

#### CARBURIZE and harden

#### STRAIGHTEN

Hydraulic press

#### GRIND outside diameter

Norton grinder

#### FINISH BORE 1 1/4 in. bore

Reed-Prentice engine lathe

furnace irons, developing dense structures of great strength and resistance to wear.

Certain features of the operation, particularly those relating to management ideals, are worthy of mention at this point. Consider, for example, the studied efforts at regularization of employment. To a large extent, this is achieved by the happy circumstance that the product is distributed in so many varied industries as to reduce violent seasonal fluctuations in activity. Even so, there are variations that must be taken into account. Such gaps are filled, first, by building certain standard parts for stock in anticipation of customers requirements; second, by building and stocking various sub-assemblies.

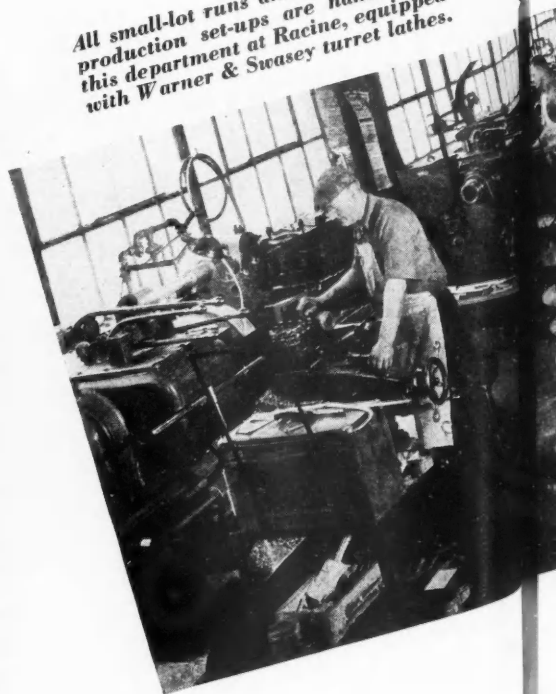
Due to the longer period of active service of agricultural and industrial and marine equipment, service parts are required for much older models and types than is customary in conventional automotive products. The company, therefore, has an established policy of carrying a complete stock of service parts for all units that

*Prize exhibit at Racine is this heavy-duty Kearney & Trecker milling machine fitted with a special universal fixture for keyseating shafts. Both the machine and fixture are of unusually massive construction so as to produce accurate keyways without vibration or chatter.*



April 1, 1940

*All small-lot runs and experimental production set-ups are handled in this department at Racine, equipped with Warner & Swasey turret lathes.*



Automotive Industries

are considered as active. Such active stores are carried in a three-story warehouse on the property in Racine, distributed to users through various channels. Obsolete parts also are available but are handled in a separate department.

To production executives, one of the most interesting of the management features is the equipment replacement policy. Guided by Mr. Batten's views on the subject, the company is permitted to set aside each year the total amount of the depreciation account and use it for the purchase of new items of production equipment. That this has borne good fruit is evidenced by the new machines that may be seen in the Racine plant at the present writing.

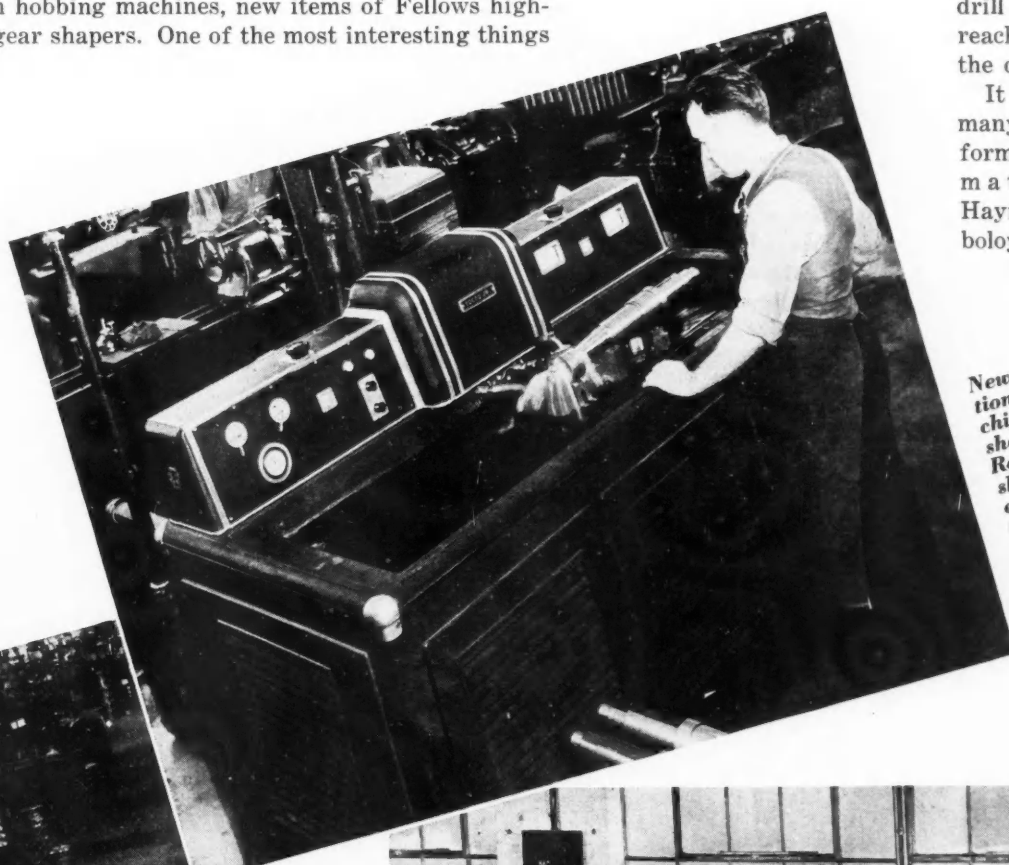
Some examples of this may be of interest. It so happens that special attention is being given to gear production. Here will be found some new Barber-Colman hobbing machines, new items of Fellows high-speed gear shapers. One of the most interesting things

is the new 10-in. Pratt & Whitney universal precision gear grinding machine, recently installed, supplemented with a number of new Illinois gear checking machines.

Unusual is a battery of six of the Monarch Magna-Matic lathes used for shaft turning; and a Tocco Jr. induction heating machine for heat-treating ends of drive shafts. Another Monarch contribution is the huge Monarch turret lathe with Keller attachment for form-turning the new hydraulic drive elements. In the case line is a battery of six Bullard V-T-L, vertical turret lathes, some of which are recent acquisitions. Another unique machine is the Davis & Thompson horizontal rifle drilling machine with hydraulic feed, used for oil line drilling of drive shafts. Shafts are drilled from both, ends, simultaneously, with the cycle

so arranged that one drill recedes just before reaching center while the other feeds through.

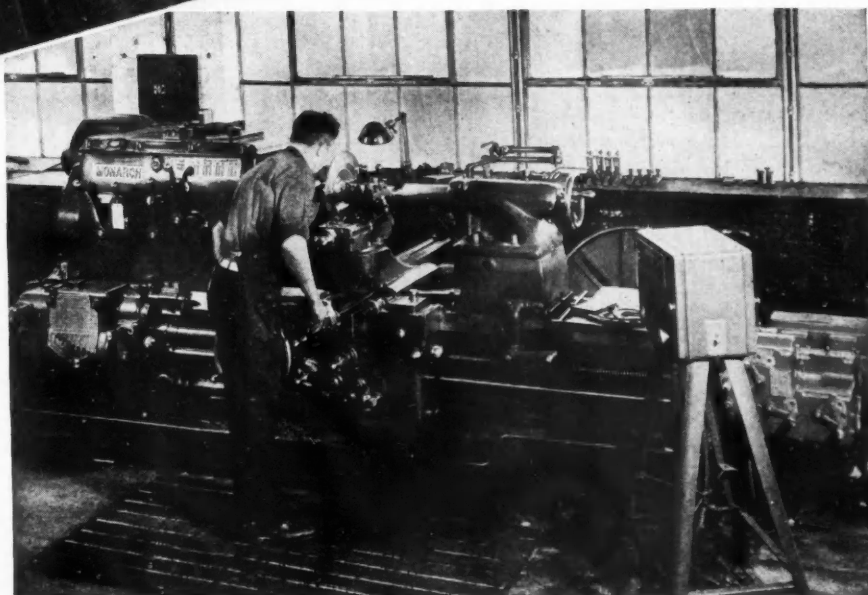
It is significant that many operations are performed with special tool materials such as Haynes-Stellite and Carbonyl, despite the fact



New Tocco Jr. induction hardening machine is found in the shaft department at Racine. Operation shows the hardening of pilot end of power take-off shaft, a selective hardening which leaves the threaded end unaffected.



(Right) Outstanding among the new equipment at Racine is this Monarch lathe with automatic Keller form-turning attachment. It is used for profile-turning of the large hydraulic torque converter elements.





## Routing for Shaft for Power Take-Off

### OPERATION AND EQUIPMENT

#### SAW

Hydraulic saw

#### CENTER DRILL

Whiton center drill

#### TURN, CHAMFER and undercut pilot end

Monarch Magna-Matic Z-14 in. lathe

#### TURN AND CHAMFER second end

Monarch Magna-Matic Z-14 in. lathe

#### MILL $\frac{1}{2}$ in. x $\frac{3}{16}$ in. keyway

Kearney and Trecker mill

#### $\frac{7}{16}$ in. drill through, $\frac{1}{8}$ in. counter-bore, $\frac{1}{4}$ in. pipe tap

Davis and Thompson hydraulic drill

#### NUMBER

### OPERATION AND EQUIPMENT

#### CROSS DRILL $\frac{1}{8}$ in. oil hole

3-spindle Foote-Burt

#### THREAD 2 in.—16P

Landis thread mill

#### FACE to length

Reed-Prentice engine lathe

#### RECENTER

Reed-Prentice engine lathe

#### Tocco HARDEN

"Tocco Jr." induction hardening machine

#### MILL $\frac{1}{8}$ in. x $\frac{7}{16}$ in. keyway

Kearney and Trecker mill

#### GRIND

72 in. Norton grinder

that much of the product is made in relatively small lots. Haynes-Stellite J-Metal is found on a number of cast iron and Gunite operations, principally on Potter & Johnston turret lathes, Bullard V-T-L machines, and on Warner & Swasey and Gisholt turret lathes. One of the P & J set-ups has ten tools while a W & S hub-and-backplate job has eight tools.

Turning our attention to the plant layout we find that economy of operation is based upon sound manufacturing philosophy which is evident as one goes through the Racine plant. To facilitate the routing of parts of such variety, they have, in general, a separate machine shop group for each of the principal types of parts. Each of these lines is equipped with machine tools of unit type or universal character, tooled for moderate volume and capable of easy changeover.

One department located in the outer bay is devoted exclusively to what may be termed multiple-lot production. It is used for small volume parts in the main but also is employed in the initial production of all new items. In effect, therefore, this department serves as the try-out for all production before tooling in the major machine shop lines.

It is well to note that in the interest of cost economy, the design of units embraces the principle of interchangeability of certain parts common to two or more units. This is true, for example, of the clutch action which

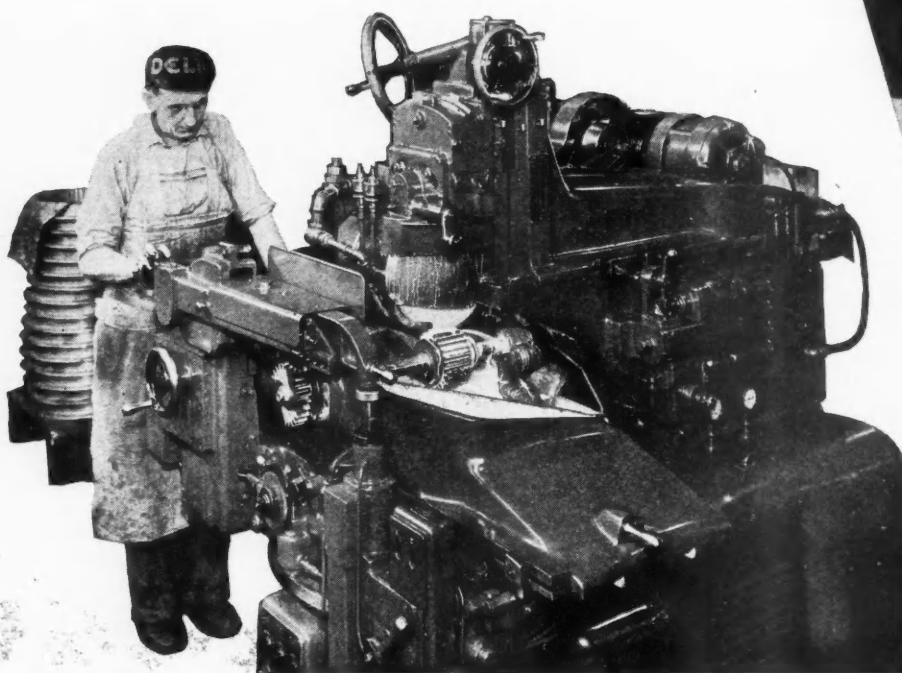
is made interchangeable for two or more clutch sizes.

Tracing a course through the machine shops, one will note the separate departments, mentioned above. Here is a line for the entire gamut of machine tool clutches. Another line for shafting, featuring the battery of six Monarch Magna-Matic lathes which are used in pairs—one for one end of the shaft, the other for completing the operation. Here is a department with 24 Potter & Johnston heavy-duty turret lathes. There is a housing line with a battery of six Bullard vertical tur-

ret lathes. The big clutches for oil field service rate a special line equipped with huge general purpose machinery. Then, too, there is a separate line for the marine reverse gear unit.

The multiple-lot department, mentioned earlier, comprises a large battery of Warner & Swasey 2A and 3A turret lathes. This marks the location of the big Monarch lathe for hydraulic drive elements.

The gear department is one of the most complete and most modern of them all. It includes a large number of Fellows high speed gear shapers; and a battery of four Fellows machines of the largest size to be found in the automotive industry. They are used for gear shaping of elements for the huge 42-in. clutches. Too, there is a large battery of Barber-Colman gear hobbers, some of which are new acquisitions.



*Latest acquisition in the gear department is the 10-in. Pratt & Whitney hydraulic spur gear grinder capable of producing gears with tooth form and spacing within 0.0002 in. accuracy.*

Finally we note the recent installation of the Pratt & Whitney gear grinder and a big Gould & Eberhardt gear hobber for the very large gears.

One end of the machine shop is devoted to finished parts storage from which are assembled the parts intended for customers' orders. These parts are delivered directly to the bench assembly line on which the clutches and marine gears and other units are assembled. All reduction gears and marine gear units

are block tested in the experimental laboratory before shipping.

Before we leave this section of the plant, it is of interest to note the attention that has been given to the details of materials handling. The shop is generously equipped with small traveling cranes and electric hoists, all designed to facilitate the handling of heavy castings, relieving the operators of much of this manual labor.

### Routing for Turbine Wheel for DF-11500 Torque Converter

#### OPERATION AND EQUIPMENT

##### HEAT TREAT

**CHUCK** on 5½ in. diameter, **ROUGH FACE** and **ROUGH TURN** leaving 1/32 in. on face and all diameters

Warner & Swasey turret lathe No. 2

**FINISH BORE** and center

**FACE** to length and counterbore 4½ in. diameter only.

Warner & Swasey turret lathe No. 2

**FINISH TURN** hub diameters from centers and thread

Reed-Prentice engine lathe

**FACE, CHAMFER, COUNTERBORE** 4.750 in. dia. and profile radius locating from centers

Monarch lathe with Keller attachment

#### OPERATION AND EQUIPMENT

**LAYOUT AND DRILL** six 13/32 in. holes

American 4 ft. radial drill

**HOB** spline locating from centers on arbor

Special Barber-Colman No. 12 hobber

**MILL** ¼ in. x ¼ in. lock ring slot

Kempsmith miller

**DRILL** thirty 25/64 in. holes

Avey four-spindle drill

**COUNTERSINK** 30 holes

Avey four-spindle drill

**IMPRESS** 30 holes with four slots in each hole

**REAM** 30 holes 0.404 in.—0.406 in.

Avey four-spindle drill

A bay on the floor above the main machine shop houses the tool room, some items of small parts production, and initial facilities for the machining of parts and assembly of the new torque converter units.

Due to the variety of operations both in Racine and Rockford, it would be quite difficult to paint more than a sketchy picture of the set-up of machine shop lines. For this reason, we have reproduced official factory routings of some typical parts which give the production man a good idea of how the work has been laid out. These routings, as well as the comprehensive pictorial section, provide an excellent perspective of the entire operation.

As the final step in visualizing the many interesting items of equipment characteristic of this plant, we have appended a section describing the special features

(Center) One of the bays in the large screw machine department at Racine which is equipped primarily with National Acme-Gridley and New Britain-Gridley machines.

(Below) Another of the machine shop bays at Racine featuring the battery of six Bullard V-T-L machines for boring and facing large housings.



of some selected machine tools, commenting also on the nature of the work they do.

Twin-Disc is justly proud of the new engineering and research laboratory placed in operation recently. Among the major items of equipment are—the massive 250 hp. General Electric dynamometer for testing hydraulic couplings and torque converters. As illustrated, this comprises the 250 hp. motor, a Brown-Lipe transmission used as the reduction unit, a small motor

driving the reduction unit, and a gasoline-powered stand-by generating unit. In one corner is a large electric motor drive unit for block testing gear reduction and marine gear units, supplemented by several smaller units for the same purpose.

Prize exhibit is the equipment and instrumentation for testing friction materials, said to be the foremost example of its kind. This machine provides a means of dynamic testing of all manner of friction linings used in the clutches. It is employed in developing new products, in checking new products from outside sources, in trouble-shooting wherever an accepted lining material develops trouble in the field. Unique feature of this device is the ability to

## Routing for Reverse Gear

for 125 hp. Marine Gear

### OPERATION AND EQUIPMENT

**TURN, DRILL, BORE**, chamfer counterbore and cut off

National Acme Gridley automatic

**SEMI-FINISH** bore

Heald Borematic No. 49

**FACE** to length and groove

Reed-Prentice engine lathe

**CHAMFER** bore and file outside diameter

Reed-Prentice engine lathe

**CUT GEAR** teeth

Barber-Colman Hobber No. 12 Type A

### OPERATION AND EQUIPMENT

**BROACH** keyway

LaPointe hydraulic pull broach

**NUMBER**

**CARBURIZE**-harden

Internal GRIND

Heald Size-Matic No. 72 A-3

**GRIND** one side on arbor

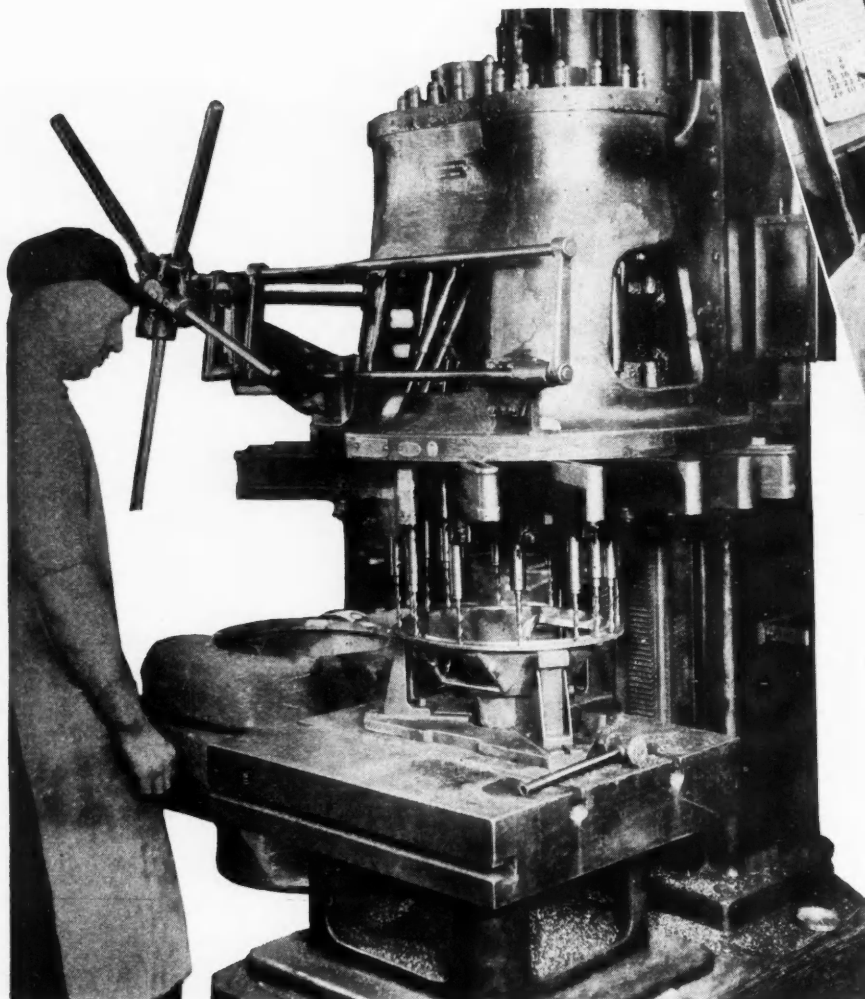
Norton grinder

**SURFACE GRIND** second side

Heald surface grinder

**GRIND** gear teeth

Pratt & Whitney 10 inch gear grinder



(Center) Close-up of one of a large battery of Bullard Multi-Au-Matics at the Rockford plant. This is a six-spindle machine set up for turning, boring, facing, and threading the hub and backplate for small clutches.

(Left) Natco multiple spindle head drill press set up for drilling one of the clutch housings.



check both the acceleration and deceleration characteristics of the material under test. For this purpose, two clutches fitted with the same facing material are employed, one at each end of the machine. Acceleration of the entire mechanism is produced by the clutch at one end; deceleration measured by using the other end as a brake.

Much of the hidden value of the product is found in the specification of the materials employed as well as in the manufacturing tolerances. Housings for the various units are made of high-grade gray iron. Clutch disks and other drive elements subject to abrasion and wear are made of various materials depending upon the nature of the service—close-grained gray iron, chrome-copper iron alloys, chrome-copper-molybdenum alloys, and more recently an electric furnace iron containing nickel, produced by the Belle City Malleable Iron Co.

Part of the reason for the longevity of Twin-Disc marine gear units and power take-off drives is found in the careful selection of materials. Certain of the gears are machined from heat-treated alloy steel, annealed, then heat-treated after machining. For such gears they employ S.A.E. 4340 and S.A.E. 4140 steels. For carburized gears, which form the major part of production, they specify S.A.E. 4615 steel. For heavily stressed shafts, drop forgings are employed using S.A.E. 4140 and S.A.E. 4340 steels. For the general run of shafts, S.A.E. 4150

steel is used. The common run of simple shafting is made from X1345, free-machining stock.

Coming to the matter of manufacturing tolerances, we find that the engineering department relies exclusively upon S.A.E. standard fits, generally even better, particularly with respect to bearing fits. To achieve this, shafts are ground on all diameters. Gear center spacing in the housings is held to less than 0.002 in. Gear tooth fits in the clutch assembly are held within 0.003 in. variation for backlash.

### Special Equipment Notes

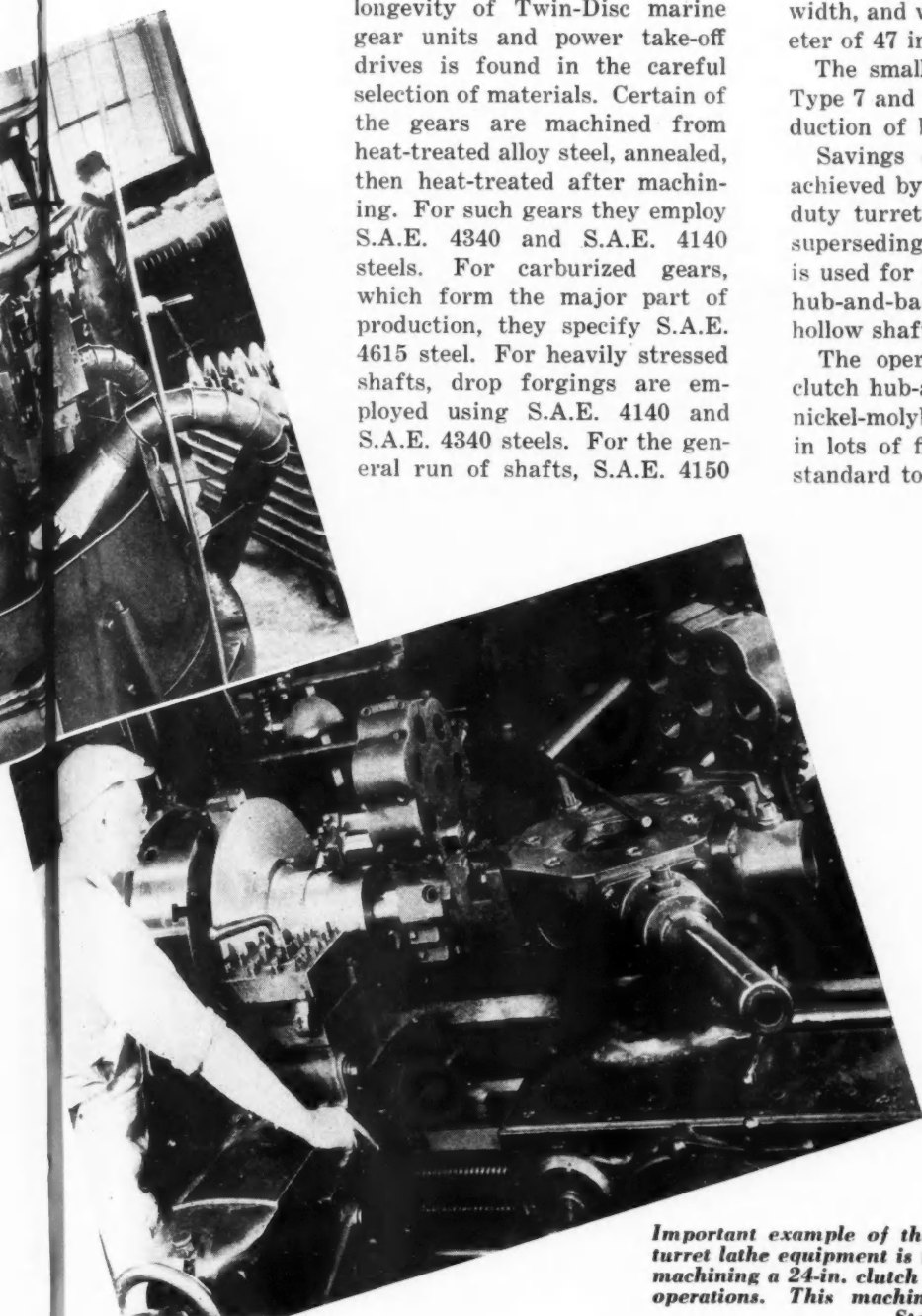
As mentioned earlier, the Racine plant is proud of its battery of Fellows gear shapers, largest of their type to be found anywhere. Known as the No. 645Y Model, these gear shapers were designed specifically for Twin-Disc for handling large diameter coarse-pitch internal gears. The machines will cut such internal gears up to 43 in. pitch diameter, 5 in. in face width, and will swing a fixture up to a maximum diameter of 47 in.

The smaller Fellows gear shapers are the familiar Type 7 and 7-A machines designed for high-speed production of both spur and helical gearing.

Savings of the order of 18 per cent have been achieved by the installation of a big Gisholt 4L heavy duty turret lathe with fixed-center hexagonal turret, superseding an old style turret lathe. The new machine is used for producing several sizes and types of clutch hub-and-back plates, center plates, adjusting yokes, hollow shafts, clutch housings, drive spiders, etc.

The operation illustrated is that of finishing the clutch hub-and-back plate 24 in. in diameter, made of nickel-molybdenum iron of 200-220 Brinell, machined in lots of five. Good example of the efficiency of the standard tools and tool-holders is apparent in the second operation of this particular job, the thread diameter and hub being turned simultaneously with the facing of the flange and the rough boring and chamfering of the piece. In these four cuts the multiple turning head in the hexagon turret holds the tools for cutting the thread diameter and hub and the boring bar for boring the inside diameter. The tool in the square turret faces the flange. Adjustable-angle tool holders are necessary for the other operations in conjunction with those mentioned.

The ability of the newer type lathe to combine cuts and also to take heavy, faster cuts and still maintain fine finish and accuracy makes it a very desirable machine for this type of work. Gisholt standard tools and tool-holders are used on this job. They permit set-ups to be made easily and quickly which is a desirable feature on the variety of miscel-



*Important example of the latest type of heavy-duty turret lathe equipment is this Gisholt 4L turret lathe, machining a 24-in. clutch hub and backplate in three operations. This machine is tooled with Haynes-Stellite.*

## Routing for Housing

for 125 hp. Marine Gear

### OPERATION AND EQUIPMENT

**MILL** parts  
Giddings & Lewis horizontal mill  
**DRILL** nineteen 5/16 in. holes, tap 3/8 in.—16  
American 3 ft. radial drill  
**ROUGH** dome end  
Bullard vertical turret lathe  
**FACE** and turn pilot, face and bore 2 main bearing holes  
Bullard vertical turret lathe  
**DRILL** ten 13/32 in. holes  
American 3 ft. radial drill  
**BORE** two countershaft bearing holes  
Bullard vertical turret lathe  
**MILL** foot pads  
Ingersoll duplex mill  
**SPOTFACE** one 3.544 in. hole. Drill five 5/16 in. holes  
American 3 ft. radial drill

### OPERATION AND EQUIPMENT

**TAP** 3/8 in.—16. Drill four 17/64 in. holes, tap 5/16 in.—18  
**DRILL** two 1 in. holes  
American 3 ft. radial drill  
**DRILL** twelve 5/16 in. holes, tap 3/8 in.—16  
American 3 ft. radial drill  
**DRILL** two 1 1/8 in. holes, tap 1 in. pipe. Drill one 1 23/32 in. hole, tap 1 1/4 in. pipe. Drill two 9/16 in. holes, tap 3/8 in. pipe. Drill one 29/32 in. hole, tap 3/4 in. pipe. Counterbore bearing hole.  
**DRILL AND TAP** housing feet. Drill one 41/64 in. hole. Drill two 9/16 in. holes, tap 3/8 in. pipe.  
American 3 ft. radial drill  
**COUNTERBORE** for one plug  
**DRILL, REAM AND COUNTERBORE** two 2 1/4 in. idler holes per ratio desired  
American 3 ft. radial drill

laneous parts that comprise the daily schedule of this machine. In many instances it is necessary only to reset some of the tools and the stops to make a complete set-up for a new part.

Due to the larger volume of production at Rockford, it has been feasible to tool many of the jobs on the battery of huge Bullard Multi-Au-Matics, a familiar type of equipment in the mass production plants of the industry. The pictorial section shows the nature of the tooling on several stations of a Bullard set-up on a hub-and-backplate for the small clutches.

An outstanding example

(Right) In the foreground is one of the big Oilgear hydraulic vertical broaching machines set up for broaching the internal drive gear in clutch floating plates.

(Below) No. 49 Heald Borematic grinder set-up for finish-grinding clutch hub and backplate bore.



(Center) New National Acme six-spindle chucking machine shown here on a set-up for boring and tapping adjusting yoke forgings.

of modernity is the Tocco Jr. induction hardening machine which is used for hardening the ends of power take-off shafts at Racine. On the operation illustrated, the end of the shaft is hardened right up to the threaded portion without affecting that section in any way. Heating time is only 8 sec., hardening to a depth of  $3/32$  in., with a hardness of 63 Rockwell C. In machines of this type, the available current is changed by a special high frequency converter to upwards of 100,000 cycles at high voltage. It is then transformed to low voltage and high amperage into the inductor coil.

One of the most impressive pieces of equipment at Racine is the new Pratt & Whitney hydraulic gear grinder with which many of our readers are familiar. It is said to make available all of the advantages of extremely fine ground gears at economical cost. Apart from cost economy, the principal advantage of the P & W machine is its ability to hold gear tooth form and spacing within 0.0002 in. And it has been demonstrated that accuracy of this order assures quiet gearing and produces gear sets with maximum load carrying ability.

Unusual feature of the production set-up is the battery of six Monarch Magna-

Matic lathes. This equipment is used exclusively for shaft turning, replacing the former automatic step-turning machines which, due to longer set-up time, were found uneconomical for multiple-lot production of the order of lots of 50 to 150 pieces. Set-up time on the Magna-Matic runs around 10 min., maximum, the total savings being estimated at 40 per cent over the best economy with the former method.

On the average, Twin-Disc runs about 700 different sizes and types of step shafts over the Monarch machines in the course of a normal year. Besides the improved economy, it is reported that the tolerance for grinding has been reduced to half the former practice due to better size control. Another important

*(Turn to page 352, please)*

## Routing for Hub and Back Plate

### OPERATION AND EQUIPMENT

**FACE, TURN, bore, undercut and ream**  
Potter & Johnston No. 5-D turret lathe

**FACE to length**  
Warner & Swasey No. 10 turret lathe

**FINISH BORE**  
Heald Borematic No. 49

**CUT GEAR teeth**  
Fellows gear shaper No. 6-A

**BROACH keyway**  
LaPointe hydraulic pull broach

### OPERATION AND EQUIPMENT

**DRILL** six  $3/4$  in. holes. Drill two  $17/32$  in. holes  
Natco multiple drill press

**TAP** two holes  $5/8$  in.—11  
Tapping machine

**DRILL** one  $27/64$  in. hole; tap  $1/2$  in.—13  
American 3 ft. radial drill

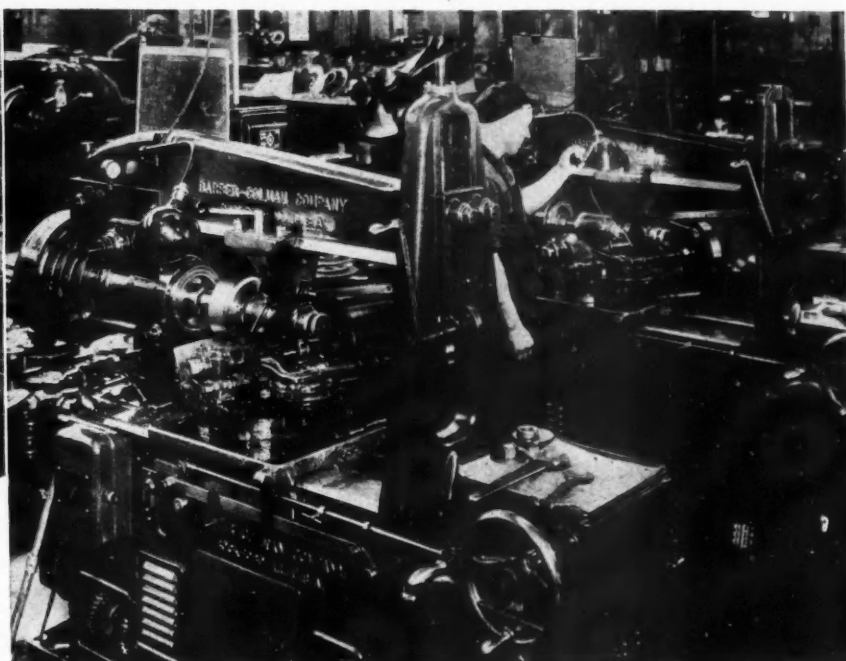
**THREAD**  
Landis threader

**FINISH FACE** friction surface  
LeBlond lathe

**BALANCE**  
Taylor static balancer



*(Below) Part of battery of new Type A Barber-Colman hobbing machines shown cutting large marine transmission gears.*





***During the S.A.E. National Aeronautic Meeting every phase of development was discussed with the pros and cons coming from all angles. In this article some of the data have been abstracted for the convenience of readers***

**C**HIEF interest at the S.A.E. National Aeronautic Meeting, held at Washington, D. C., March 14 and 15, centered around the light airplane and its engine. This type of machine, stemming from the power gliders of the early thirties and at one time referred to as a "flivver plane," has found a ready market in recent years, and its technical development has been quite rapid. Production in the United States increased from little more than 100 in 1934 to nearly 3500 in 1939, the past year having seen the greatest annual increase to date. Naturally, the representatives of producers of these planes and of the engines that go into them were in an optimistic frame of mind at the meeting. However, a note of warning that the curve of production might not continue to rise at the present rate, and that it might even develop an inflection, was sounded by officials of the Civil Aeronautics Authority and of the Bureau of Air Commerce. It has been found that owners of light planes seldom retain their license longer than two years, and an inquiry made by the Bureau of Air Commerce revealed that the chief reason for giving up private flying after so short a period is that the expense of operation turns out to be greater than anticipated. One item of expense that was found to be particularly onerous was the high landing-field fees. The next most frequent reason given was "too much regulation."

For the past several years these light planes have been powered for the most part with engines of 40-50 hp., of the four-cylinder, opposed, air-cooled type. It is believed that the demand for machines with engines of this output will continue for student training, but recently demand has arisen for three-place machines and for machines of higher performance, which call for engines of from 75 to 90 hp. The three principal producers of engines for this application, Continental, Lycoming and Aircooled Motors, all have added engines of higher output to meet this new demand. Papers on these new developments were presented at the meeting. The engineering staffs of these firms did not content themselves with merely increasing the piston displacements, but introduced design features that are new in this particular field, with the objects of reducing the specific weight, the fuel consumption, and the cost of production, these new features including reducing gears, fuel injection, and dynamic balancing. It was stated in this connection that the ideal, the

**The big upturn in the production of small planes during 1939 as well as the years immediately preceding sets an all-time record in light aircraft production**

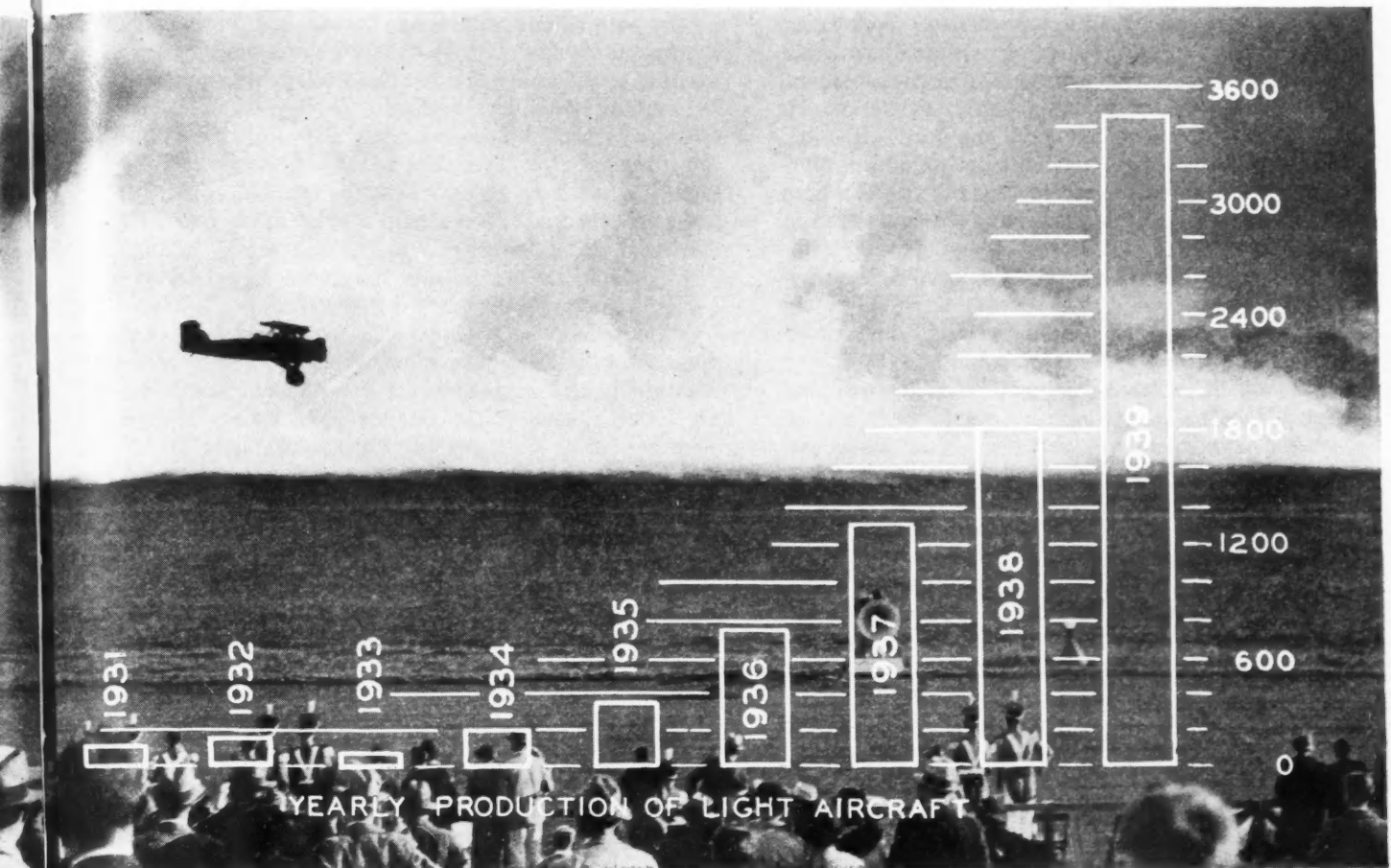


## Small Plane

dream of the light-plane builder was an engine of 100 hp. weighing 100 lb. and costing \$100, but Robert Insley of United Aircraft Corporation, who presided at one of the sessions, thought that this picture was not quite complete and that it should be added that the dream might possibly be realized "in 100 years."

One session of the meeting was devoted to what amounted to a symposium on fuel tanks for aircraft and their installation, with a paper on vertical fins thrown in. At another, the subject of passenger comfort in air travel was dealt with by representatives of two air transport lines.

A number of contributions to the meeting came from the National Advisory Committee for Aeronautics, including the paper on vertical fins already referred to (by F. L. Thompson), a paper on Performance of Spark-Ignition Aircraft Engines with Fuel Injection, by Oscar W. Schey, and a demonstration of the N.A.C.A.'s new high-speed photographic apparatus in its application to the study of combustion phenomena, by A. M. Rothrock. The last two sessions of the meeting were devoted to papers on light planes and their engines.



## Production Climbed in '39

On Friday afternoon three bus loads of those attending the meeting paid a visit to the National Bureau of Standards, where they inspected the Nafotel apparatus for testing aircraft spark plugs, the Parr ignition indicators for testing aircraft spark plugs in flight (a neon lamp becomes extinguished when the corresponding spark plug fails), bearing- and wear-test equipment, the oil-filter test laboratory, apparatus for the synthesis of paraffin hydrocarbons suitable as blends for motor fuels, corrosion tests of aircraft metals, apparatus for making fatigue tests of aircraft propellers, the aircraft-instrument testing laboratory, apparatus for testing wing beams in vibration, apparatus for extinguishing fires in aircraft powerplants in flight, and the wind tunnel of the bureau. The meeting concluded with a banquet on Friday evening at which Wm. B. Stout acted as toastmaster and Hon. Clinton M. Hester, administrator of the Civil Aeronautics Authority, spoke on International Air Transport.

### Fuel Tanks

There were three contributions to the symposium on fuel tanks, by F. D. C. Albright of Vought-Sikorsky

Aircraft Division, United Aircraft Corp.; Niles Bartholomew, Curtiss Aeroplane Division, Curtiss-Wright Corp., and F. J. Pepersack and C. R. Roberts, Glenn L. Martin Co. Mr. Albright spoke on the experience of his company with integral fuel-tank construction. The most difficult problem in such construction is to produce fuel-tight joints. At first 1/16-in. neoprene sheets were used between metal parts, with a plentiful amount of neoprene cement applied to them. In the words of the author, the result was a "mess." The neoprene sheet was later replaced by PAW tape, consisting of cotton tape impregnated with the neoprene compound and having a layer of dry adhesive applied to each face. This gave a good job, except for the fact that the adhesive used was soluble in gasoline, which rendered it impractical for this purpose. DuPont No. 5005 tape was next used, which is similar to the PAW tape but has no adhesive applied to it. Each metal surface of the tank joint was painted with wet neoprene cement and allowed to dry for several hours. The tape was then installed between the two cemented surfaces which were then riveted together, with a tape washer under each rivet. Double-riveted joints are always

used, with rows spaced  $\frac{3}{8}$  in. and rivets in each row,  $\frac{3}{4}$  in. Tanks so constructed gave reasonably satisfactory results; there were still some objectionable features and these were overcome by applying the cement to the tape instead of to the metal surfaces.

Mr. Bartholomew dealt with the design and production of welded fuel tanks, which type of tank has been standard with the Curtiss Company during the past several years. These tanks are made of aluminum alloys (principally 4S and 52S). Tanks should weigh from 0.5 to 0.8 lb. per gal., the larger tanks naturally having the lower specific weight. When the projected area is approximately equal in all planes, the tank may be made without baffles. When 3S is used the material gage should be about 0.081 in. All surfaces should be curved and all corners well rounded. Wing tanks are usually baffled because of their thin section. When baffles are used the gage of the shell material may be as low as 0.041 in., depending on the spacing of the baffles. Since most tanks are supported by metal straps lined with either rubber- or fabric-covered felt, loading conditions at the corners improve with an increase in the corner radius. All tanks are designed with a bead running parallel with welded seams, to prevent warpage in welding.

Messrs. Pepersack and Roberts in their paper explained that two types of fuel tank have been used on aircraft in the past, the removable metal tank and the built-in or integral metal tank (referred to in the foregoing). Both of these have certain advantages and disadvantages, and it was with the object of combining the chief advantage of the former, the ease with which it can be installed, with the somewhat greater capacity and lower weight of the built-in tank, that the Glenn L. Martin Company developed the Mareng Cell fuel tank.

A bag or cell is made of Grade A airplane cloth, which is impregnated and calendered with neoprene on both sides. This cell, which is lodged in a compartment of the wing, fuselage or float, forms a flexible, vibration-proof fuel container, and all stresses caused by the weight of the fuel are taken by the structure of the wing, fuselage or float. The dimensions of the completed cell are made larger than those of the compartment into which it is inserted, to prevent stress in the cell material. Sections of the cell are made to the desired shape and size and are joined together by a cemented lap joint reenforced by a double row of stitches. To prevent the stitches on the inside of the cell from coming in contact with gasoline, a thin neoprene cover is cemented over them.

A hole through which the cell may be installed is provided in the compartment wall, and a similar opening is incorporated in the cell. This opening is so located as to give access to any part of the interior. The material of the cell around this opening and also that around the various fittings is reenforced with neoprene-coated fabric, cemented and stitched to the cell. By the use of inner and outer fittings the cell is clamped to the housing, a seal is provided, and the cell is supported from the compartment walls.

After all cementing and stitching has been completed, the cells are cured in an oven. They may be built as multiple units for installation between bulk-

heads, with openings in the bulkhead sufficiently large so that all fittings can be reached from one "access" opening, or in the form of single cells interconnected by vent and fuel-flow holes, in which case an access opening is provided in each cell. The interior of the compartment for the cells must be comparatively smooth, and sharp corners must be avoided. Cells are inspected for leakage while in a wire-mesh cage and filled with gasoline.

### **Passenger Comfort**

A special session was devoted to problems of passenger comfort in air travel, at which two papers were presented, one by Walter J. Forster of the St. Louis Airplane Division of the Curtiss-Wright Corporation, the other by W. W. Davies of United Air Lines Transport Corporation. In these papers such topics as space per passenger, interior design, noise prevention, heating and ventilation, lighting, catering, oxygen equipment, lavatory facilities, sanitation and fumigation, operation and vibration were discussed. One point brought out was that in order that passengers may travel in comfort, the pressure within the cabin must be raised above that of the surrounding atmosphere when the altitude at which the ship travels exceeds 10,000 ft.

### **Fuel Injection in Spark-Ignition Engines**

A general survey of the problems involved in fuel injection in spark-ignition engines has been made by the N.A.C.A. The tests made covered air-cooled engines, variously-shaped combustion chambers, different types of injection valves and nozzles, different types of fuel injection pumps, various locations of the injection valve, various valve-opening pressures, scavenging of the clearance volume by valve overlap, comparative performance with safety fuel and gasoline, and with manifold-injection, cylinder-injection and carburetor. This investigation was discussed in a paper by Oscar W. Schey.

The tests showed that for maximum power and best economy, injection should start from 60 to 90 crankshaft deg. after the beginning of the suction stroke. In general, injection periods of from 60 to 90 deg. crank angle gave best results. If the air flow is not conducive to good mixing, the injection period should be longer. With strong turbulence a short period of injection results in a small gain. The best location of the spray nozzle in the cylinder head varies with the form of combustion chamber. With gasoline, best results were obtained with a multi-orifice nozzle. On the whole, the performance did not change much with moderate changes in injector location, start of injection, and length of injection period.

A combustion-chamber form ensuring strong turbulence is very desirable. The power output for each of three methods of mixing the fuel and air varies substantially as the volumetric efficiency and is higher with fuel injection into the cylinder than with a carburetor or manifold injection. In single-cylinder-engine tests the minimum specific fuel consumption is the same with all three methods of mixing. For the same power output and cooling condition, the cylinder temperatures are the same with all three methods. The



clearance volume of a four-stroke-cycle engine having two intake and two exhaust valves can be scavenged completely with a pressure difference of 3 to 5 in. of mercury column, when using valve overlap of 120 to 130 crank deg. The scavenging obtained on two-valve engines was not as good.

Operation with valve overlap does not impair idling characteristics, if a throttle valve is provided in or near the inlet port of each cylinder. The use of fuel injection, valve overlap, and a turbo supercharger is an ideal combination. Power output and fuel consumption are practically the same with safety fuel having a flash point of 134 F. as with gasoline, and any reasonable safety requirement can be met without sacrifice in performance.

### Barrel-Type Engines

The engine which "flies through the air with the greatest of ease"—in other words, the barrel-type engine—was the subject of a paper by E. S. Hall, manager of The Round Engine Patents. "You wouldn't shoot a bullet crosswise," said Mr. Hall, "why persist in shooting cylinders that way?"

The advantage of the barrel-type engine for aircraft purposes is that for a given output it has a smaller frontal area, and therefore engenders less drag, than any other type. A comparison of frontal areas of engines of different types is made in the accompanying illustration. (See the next page). The sketches represent the frontal areas of the engine types listed, which also gives the frontal areas in square feet and the drag horsepower of 2000 hp. engines at 400 m.p.h.

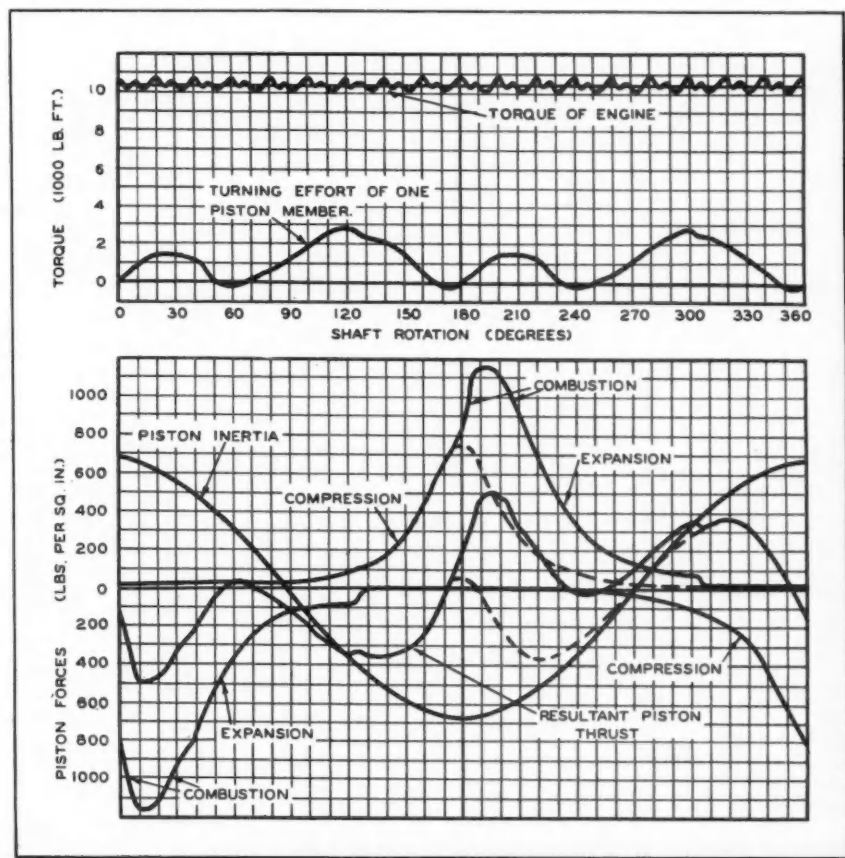
One interesting point brought out in the paper was that if the pistons of the engine have a true harmonic motion (as they have in most barrel-type engines), engine speeds can be increased by about 12 per cent without increasing the maximum inertia forces, because in a conventional engine with crank mechanism the inertia forces are about 50 per cent greater in top than in bottom dead center and therefore 25 per cent greater than they would be in an engine with harmonic motion, in either dead center.

Although good engineers have found it possible to live comfortably with it, the crank mechanism has serious faults, Mr. Hall said. These faults are of such importance that it

ought to be possible to find a barrel-type engine mechanism not only as good as the crank mechanism, but better—as much better as the form of the barrel engine is better (for aircraft purposes) than that of any other engine type.

There is not much to be found about barrel engines in books, said Mr. Hall, but in the Patent Office in about a month's time one can learn that about a thousand different patents on barrel engines show only a half dozen different mechanisms. Of these the author considered three impractical for high-speed engines, these being the bevel-gear type in which the individual crankshafts of cylinders are geared to a common output shaft, the single-ended conic-crank mechanism, and the angular rotary mechanism in which the cylinder block and output shaft are not co-axial. This leaves the following three types as having practical possibilities (in the opinion of the author). The swashplate and slipper mechanism in which the swashplate is fixed on the shaft and the slippers are pivoted in the piston members; the cylindrical cam mechanism with roller cam followers on bearings in the piston members, and the wabbler mechanism in which a wabbler is mounted on bearings and inclined to the shaft, the rim of the wabbler being connected with the pistons in one of several ways.

Engines of the different types were illustrated by sectional views, and described, and in the latter part of his paper the author discussed the relative advantages of various combustion systems for barrel-type aircraft engines, and also such problems as breathing systems,



Efficiency curves of a barrel-type aircraft engine submitted by E. S. Hall

uniflow scavenge, and port scavenge. Specifications were given for an 18-cylinder 7 by 8-in. two-stroke engine with a wabblers-type mechanism which the author believes can be built to have a frontal area not exceeding 7 sq. ft., to deliver 5000 hp. at 3000 r.p.m. and to weight not over 3000 lb.

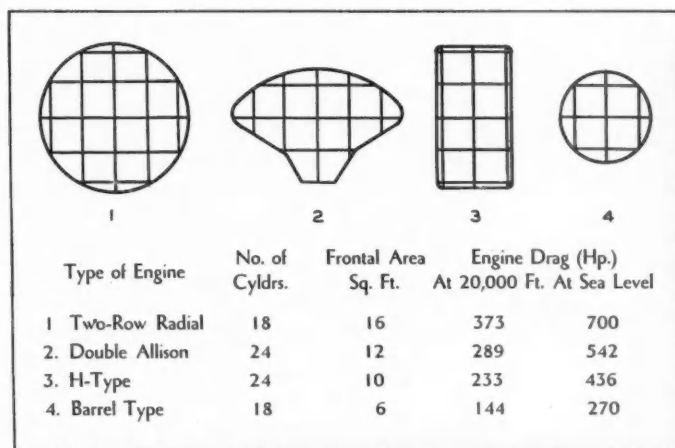
The barrel-type engine seems to have special advantages when used as a two-stroke Diesel. Since pairs of cylinders are placed in line with each other and the two cylinders contain a single piston unit, this unit is subjected to an explosion at the beginning of each stroke, and the high pressure of the explosion can be balanced by piston inertia to a large extent, so that bearing loads will be moderate. One of the drawings herewith gives curves of gas pressure, inertia force, resultant piston thrust, turning moment of one piston member, and total engine torque throughout a revolution of the output shaft. It will be seen that the turning moment of one piston unit is nearly always positive, there being two moderate impulses per stroke. There are 36 impulses per revolution on the output shaft, with variations from the mean not exceeding 3 per cent.

Among barrel-type engines illustrated and described in the paper were designs by Almen, Callan, Chilton, Coney, Coombs, Hall, Herrmann, Lake, Macomber, Michell, Nevatt and Redrup.

#### **High-Speed Photography of Combustion Phenomena**

The National Advisory Committee for Aeronautics has further developed its high-speed photograph camera and can now take pictures at the rate of 40,000 frames per sec. Since moving pictures are projected at the rate of 16 frames per sec., this permits of slowing down a phenomenon filmed in the ratio of 250:1. The apparatus has been used in filming flame propagation across a combustion chamber, and slow-motion pictures of flame propagation under conditions of normal combustion, preignition and detonation were exhibited and explained by A. M. Rothrock of N.A.C.A. The pictures were taken by what is known as the Schlieren method, on an engine which has a large window in the cylinder head. The flame front or reaction zone, which appears in the form of a smoke band, appears to be traveling very leisurely from the spark points toward the opposite wall of the combustion chamber. Its velocity increases from the spark plug to about the center of the combustion chamber, and then decreases until the opposite wall of the combustion chamber is reached. This, of course, is due to the fact that the flame front velocity depends on both the rate of reaction and the physical motion of the gases due to expansion on burning and compression of the still-unburned gas.

Preignition was produced by means of an electric coil on the wall of the combustion chamber opposite the spark plug. Under these conditions combustion would start at opposite sides of the combustion chamber, the combustion wave starting at the heating coil leading that starting at the spark points, and combustion



*A comparison of frontal areas of different types of aircraft engines*

would end in a transverse zone extending across the combustion chamber somewhere between the two points of ignition—nearer the spark plug, of course. Ignition could be effected simultaneously at four equidistant points, the cylinder having four spark plugs, and would then terminate at the center of the combustion chamber.

In case of detonation the combustion wave travels most of the distance across the combustion chamber in the same way as in normal combustion, but the last end of the path across the combustion chamber appears to be traveled at an infinite speed, which is entirely in accord with theory. Also, it can be seen that when detonation occurs a vibratory effect is produced in the combustion chamber. Why this should be so can be readily understood when it is considered that normal combustion produces a displacement of the charge due to its expansion on combustion, and that the practically instantaneous combustion of a considerable portion of the charge must produce a violent displacement that sets up elastic forces which spend themselves in elastic motion or vibration in the cylinder.

The showing of these engine-combustion films was greatly appreciated by a large attendance.

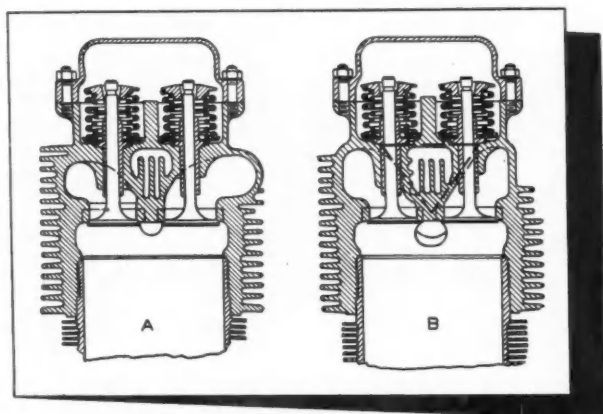
#### **Continental Geared Engine With Fuel Injection**

Continental Motors has developed an 80-hp. from its 50-hp. engine by raising the speed from 1900 to 2700 r.p.m. and increasing the compression ratio from 5.4 to 7.5, thereby raising the b.m.e.p. from 122 to 137 lb. Of course, a speed of 2700 r.p.m. is too high for direct drive of the propeller, and a gear reduction is used, consisting of a spur pinion and an internal gear. Features of the high-output Continental engine for light aircraft were discussed in a paper by C. F. Bachle. An important problem in the design of such an engine consists in minimizing deflection of the cylinder head due to thermal or mechanical stresses, to prevent valve-seat distortion. The center of the head between the two valves is the point on which effort must be concentrated. There must be sufficient resistance to combustion pressure to prevent "dishpanning," and in ad-

dition the cooling means must be adequate, as this section of the head usually attains the highest temperature. The drawings herewith show both the original and the final design (A and B, respectively). The final design provides for the maximum finning in the air tunnel between the valve ports, which latter are separated farther. The arrangement of the fins strengthens the combustion-chamber crown, but the greatest stiffening effect is derived from tying the ports together through the valve-rocker chamber.

With an increase in output from an engine of given displacement the demands on the valves and their seats become more severe, and aluminum-bronze inserts and austenitic-steel valves had to be replaced by seat inserts of austenitic steel and stellite-faced valves.

Waffle-iron finning on the under side of the piston crown increases the rate of heat transfer, and ring sticking can be guarded against by providing an aux-

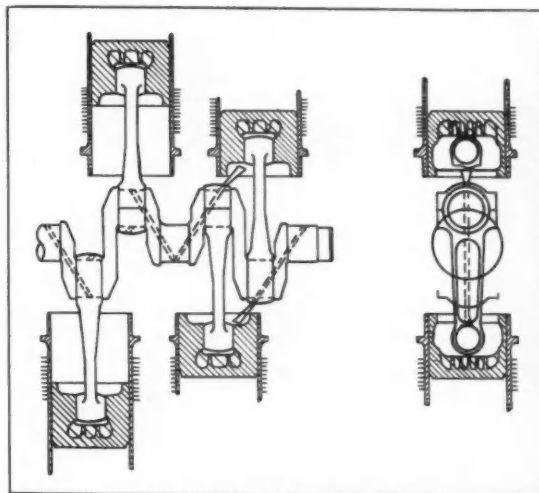


*Cylinder head design described by C. F. Bachle*

iliary oil throw-off from the connecting rods, which in a four-cylinder opposed engine can be easily arranged, as shown in the accompanying drawing. An intermittent oil jet is provided by registration of the oil hole in the crankshaft with a hole in the connecting-rod cap, the proximity of the cap to the piston allowing the jet to enter the piston without much oil striking the cylinder wall. Hydraulic tappets are used in this as in the earlier Continental light-aircraft engines.

A major development of the past year has been the adoption of fuel-injection apparatus manufactured by Fuel-Injection Corporation, Muskegon, Mich. As shown in two sectional views in one of the illustrations herewith, this apparatus contains two constant-stroke plungers having a combined reciprocating and turning motion, which latter motion permits each pump barrel to serve two cylinders. Injection is into the intake manifold directly ahead of the intake valve. The nozzle is provided with a check valve which regulates the discharge pressure and also prevents evacuation of the fuel line by intake-manifold depression at part throttle.

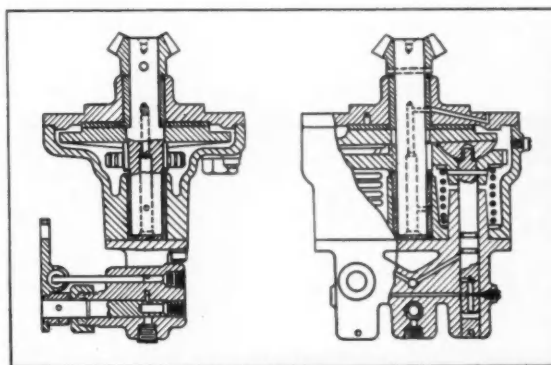
Sealing of the pump plungers and lubrication of the parts are provided by engine oil which is led through small passages to each plunger. Fuel which leaks past the plunger during the pressure stroke is conducted to



*Method of supplying auxiliary oil to pistons for cooling explained in a paper on fuel injection*

the intake manifold through an annulus and tube, which latter also returns any excess oil that is trapped in the annulus. The quantity of fuel and oil leaking past the plunger is said to be very small. Mixture-ratio control at part throttle is accomplished by restricting the inlet to the pump plungers with a valve actuated by the air throttle through a simple linkage. Under part-throttle conditions, less than the full plunger-displacement of fuel is required, and restricting the plunger inlet reduces the quantity of fuel inducted, depending on the degree of restriction. Fuel and air are throttled by similar action, with the difference that a part of the fuel is converted to the gaseous state after passing the fuel throttle. Variations in fuel volatility might be expected to cause variations in fuel flow for a given throttle setting, but experience is said to have shown that for the range of fuels used in aircraft engines the variation from this cause is negligible.

Altitude compensation is provided by selection of restriction conditions at the fuel throttle. Flow through the throttle depends on the pressure differential, as in any fluid system; however, at altitudes the differential is reduced by the inability of the injector pump to pro-



*Sectional view of injection pump used on a Continental engine for aircraft service*



duce the required lower absolute pressure on the low side of the fuel throttle. Compensation is obtained under all throttle settings by providing restriction at full throttle and increasing the pump displacement to compensate for this restriction to obtain the required full-throttle flow. Contrary to expectations, a primer is necessary for starting, because at cranking speeds the injector does not build up sufficient pressure to open the check valve in the nozzle.

### **Rationalization in Light-Engine Production**

Light airplane engines, according to Carl T. Doman of Aircooled Motors Corporation, are engines of less than 100 hp. Mr. Doman stressed the necessity of bringing down the cost of production of such engines and suggested as one possible solution the production of aircraft and industrial engines with many parts interchangeable between the two. A still further reduction in costs can be achieved if some of the major parts, while not interchangeable, can be handled on the same production fixtures, as, for instance, aluminum crankcases for the aircraft and cast-iron crankcases for the industrial engines. Mr. Doman mentioned that the three largest producers of these light aircraft engines in 1939—Continental, Lycoming and Aircooled—all had considerable previous experience in automobile-engine production.

In designing a four-cylinder opposed engine for both aircraft and industrial uses, it was found that the carburetor equipments would have to be different. The aircraft engine has an up-draft carburetor with the manifold distributing zone within the crankcase, while for the industrial engine, where there is no room for a carburetor below, a downdraft-type is used. In the aircraft engine a cylinder with integral head, cast of aluminum alloy and provided with a liner of alloy cast iron, is used, while the industrial engine has cast-iron cylinders with aluminum heads cast and shrunk on. Complete machining of the combustion chamber in the aircraft engine was found necessary, as otherwise the compression ratio was apt to vary by half a ratio. Valve guides, valve seats and cylinder liners are shrunk in place while the cylinder is heated to 600 deg. Among the parts of the two engines, which are interchangeable, are the connecting rods, valves, valve seats, valve guides, valve-rocker arms and valve pushrods. The crankshafts had to be different, that of the aircraft engine being made of 3140 steel, while that of the industrial engine is of carbon steel and has its journals Tocco-hardened. Bearings of both engines are identical, except for the thrust bearing, which must be larger in the aircraft engine on account of the high propeller thrust. Oil pumps are identical in dimensions but made of aluminum alloy (gears and housing) for the aircraft engine and of cast iron for the industrial type. There are a good many other points of similarity.

After the two engines referred to in the foregoing had been in production for 18 months there arose a demand for an aircraft engine of greater output than the 50 hp. at 2750 r.p.m., which the original aircraft engine developed. About 80 hp. seemed to be called for, and six different designs were worked out, viz., a four-cylinder opposed of 241 cu. in. displacement, an eight-

cylinder inverted V of 241 cu. in. displacement, a six-cylinder in-line inverted of 180 cu. in. displacement, a four-cylinder-opposed, geared, of 153 cu. in. displacement, a six-cylinder opposed of 180 cu. in. displacement and a four-cylinder opposed of 180 cu. in. displacement. The last-mentioned design was chosen for production, for one reason because it involved no basic change from designs with which the company had had long experience. It has a 4-in. bore and 3½-in. stroke and develops its 80 hp. at 2650 r.p.m. with a compression ratio of 7, on 73-octane fuel. With dual-ignition equipment the weight is 170 lb. The new engine has cylinder barrels of cast iron, with aluminum-alloy heads screwed to them, it having been found that the weight is only 0.9 lb. per cylinder more than if the original aluminum cylinder with cast-iron liner or forged-steel cylinder were used. Considerable change has been made in the crankcase design from the earlier engine, in order to broaden the scope of possible applications, as with the oil pump separate the engine may be installed in the wing or operated as a dry-sump engine with widely varying oil-sump capacities.

To be able to offer the engine with complete electrical equipment at an attractive price, an automobile starter and generator were adapted for installation on it. A 6-volt battery of 12 lb. is required, and the electrical equipment adds approximately 28 lb. to that of the engine with dual ignition equipment only. The battery capacity, of course, is quite limited and will crank the engine for a short time only, the current draw being about 160 amps. at 150 r.p.m., with the engine at 10 deg. Fahr. or over. An industrial engine of similar design is to be offered later.

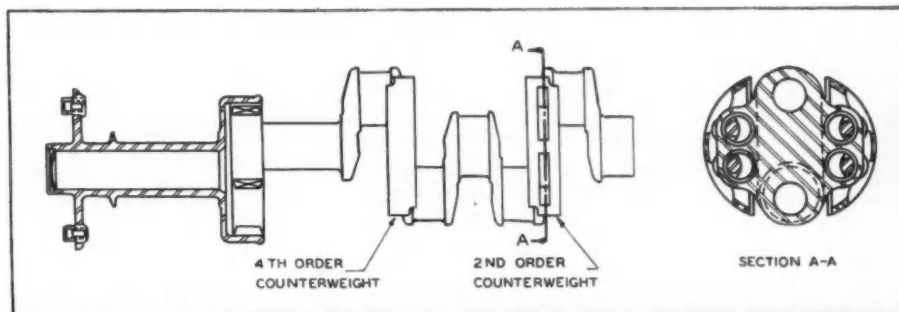
### **Light Planes**

C. G. Taylor, one of the pioneers of the light-plane movement, traced the history of this movement. He said light planes today greatly outnumber other types of aircraft; they have made it possible for thousands of people to master the art of flying, and the numbers of hours of flying these planes now exceeds the schedule of airline flying. One of the most impressive events of the year in the light-airplane field was the "Light-Plane Cavalcade to Florida" in which 700 planes from all parts of the country assembled at Orlando. They were flown by people in all walks of life "just everyday folks like you and I," said Mr. Taylor.

### **Geared-Type Light Engine**

Whereas up to a short time ago light airplanes were equipped with engines of about 50 hp. rating, the demand is now for 75 hp. and the change in demand confronted the manufacturers of such engines with the problem of how to satisfy it in the most practical manner. The study made of this problem by Lycoming Manufacturing Company and the solution arrived at by it were dealt with in a paper by C. H. Wiegman. Lycoming's new 75-hp. engine is very similar in design to the original Lycoming four-cylinder opposed aircraft engine, which developed 50 hp. at 2300 r.p.m. with single ignition. The increase in output was achieved by converting it to a geared engine, at which it develops 75 hp. at 3200 r.p.m., with dual ignition and increased compression. The reduction gear consists of

**Geared engine crankshaft and propeller shaft system described by C. H. Wiegman.**



a pinion and internal gear, both case-hardened. The internal gear, which is formed integral with the propeller shaft and flange, is supported by a long bearing with copper-lead lining. This type of reduction gear, with a ratio of 1.588, permits the crankshaft and propeller shaft to rotate at 3200 and 2015 r.p.m., respectively, in the same direction, and the  $\frac{7}{8}$ -in. offset allows the gearcase to blend nicely into the crankcase.

At first considerable trouble was experienced from torsional vibration, owing to the high engine speed. There were two pronounced critical speeds, due to harmonics of twice and four times the frequency of rotation, respectively, and it was found that a Lanchester-type damper could not be made to give relief from both. It was therefore decided to use the pendulum-type of dynamic damper which has proven so successful in large aircraft engines. The drawing herewith shows the crankshaft and a section through the dampers. Dampers are made in pairs to simplify the crank-

shaft balancing problem. A pair of fourth-order dampers are attached to the second crank arm, and a pair of second-order dampers to the fifth arm. It was found that switching the two dampers around did not affect their effectiveness materially. Without dampers the reduction gear was extremely noisy and there was even a case of pinion failure, while with the dampers the torsional amplitudes are small, gear stresses, propeller stresses and bearing loads are reduced, and lighter gears can be used.

The Lycoming O-145 geared engine (Approved-Type Certificate No. 210) has a bore of  $3\frac{5}{8}$  in., a stroke of  $3\frac{1}{2}$  in. and a displacement of 144.5 cu. in. It develops 75 hp. at 3200 r.p.m. on 73-octane gasoline, with a compression ratio of 6.5. The cruising fuel consumption is given as 0.5 lb. per hp.-hr. and the oil consumption as 0.01 lb. per hp.-hr. With single ignition, minus propeller hub and cylinder air baffles, the engine weighs 181 lb.

## Continental Mechanical Fuel Injection

**A** NEW fuel injector has been developed by Continental Motors Corporation in conjunction with the Fuel Injection Corporation. The injection system has been A.T.C.'d on the A-65, A-75, and A-80 models.

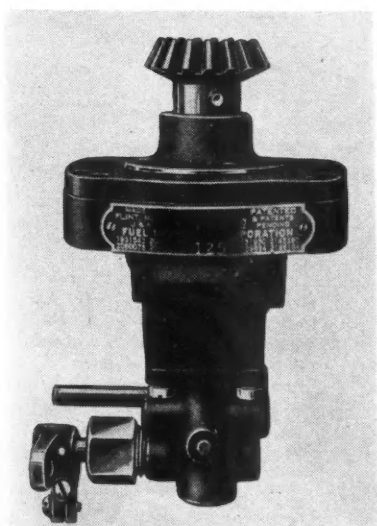
This injector, mounted at the forward end of crankshaft and driven from the front end of camshaft is of compact design. It is enclosed in an air scoop, which

conducts the air blast to the air-intake unit. The valve which meters the fuel through the injector and the throttle controlling the air to the engine are linked together so that any degree of opening or closing simultaneously affects both.

The injector unit consists of cylindrical plungers which reciprocate for pumping and rotate for positive valving. Plungers rotate at one-half of the injector speed, so that one plunger is made to serve two cylinders by alternately discharging first to one and then to the other. The action is said to be positive and not only to deliver more power and to save fuel, but to give smoother operation and complete dependability in every maneuvering position.

The individual spray jets which atomize the fuel are at the intake ports, and the fuel lines are solidly filled with fuel between each spray discharge. The finely atomized fuel is discharged in the shape of a solid cone. This charge is picked up by the inducted air and is vaporized as it is carried into each cylinder. This vaporizing of fuel in the intake ports absorbs heat and enables a greater weight of charge to be inducted.

Other advantages claimed are the reduction of fire hazard, elimination of engine failure due to water in gasoline, and—most important of all—it automatically prevents carburetor icing troubles.



**View of the Continental fuel injector. Sectional views are shown on page 325 in conjunction with a description by C. F. Bachle.**

# MEN and MACHINES

**O**UR booming aircraft industry unquestionably is becoming an increasingly powerful influence in inspiring the designers of machine tools to new heights of ingenuity. One of the newest pieces of equipment developed especially for use in aircraft plants is a metal stretching press built by the Engineering & Research Corp., Riverdale, Md., for the Glenn L. Martin Co. near Baltimore, Md. It is the first machine of its kind to be built and operated in the United States, and is employed principally for the forming of large sheets, such as skins and engine cowlings which previously were shaped on a power hammer. Although it does not displace the drop hammer, it is suggested that it may in the future be used to manufacture some parts now made on that type of machine.

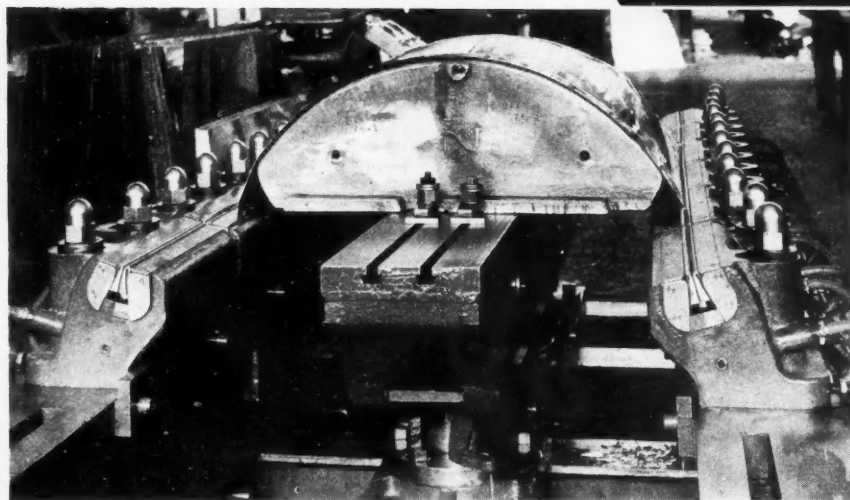
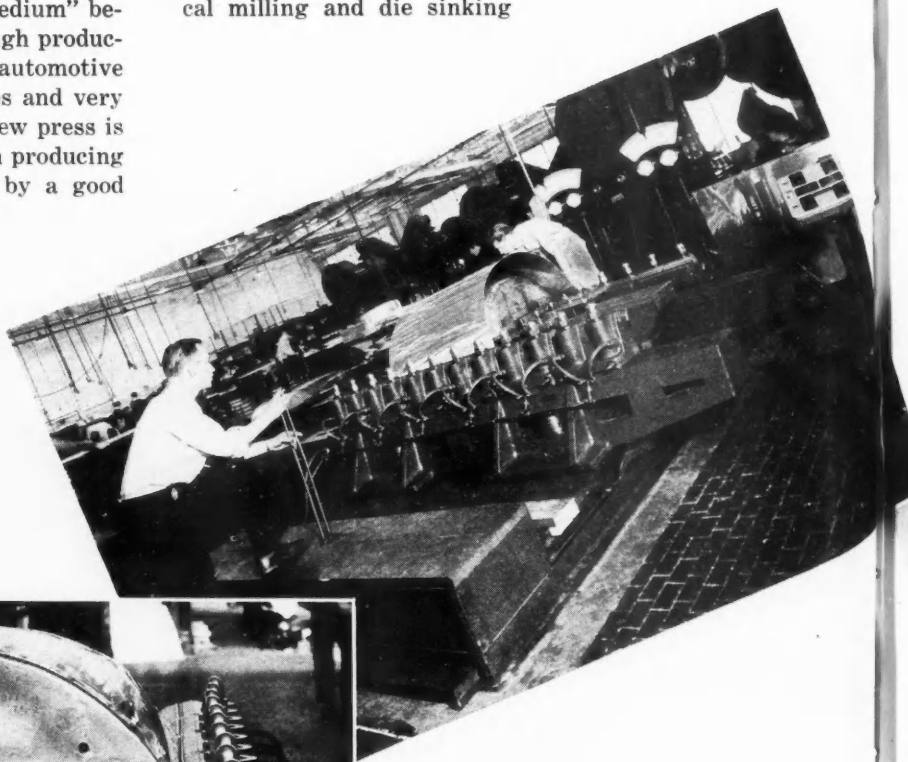
Forming by the stretching process is referred to by Martin production engineers as a "happy medium" between the earlier hand operations and the high production forming methods characteristic of automotive plants which require expensive forming dies and very powerful presses. Actual operation of the new press is quite simple and it is said that experience in producing parts by this method is acquired quickly by a good sheet metal man.

Essentially, the machine consists of two hydraulic cylinders placed beneath a platen between two rows of independent clamp jaws. The cylinders raise or lower the platen vertically and can be operated in tandem, making it possible to obtain an angular position of the platen if desired. Controls for operating the press are located on a panel

placed on a stand that may be moved to any convenient point near the machine.

In operating the press a form is placed on the platen. The sheet of metal to be stretched is placed over the form and clamped tightly in both rows of jaws. Pressure applied on the hydraulic cylinders causes the platen to move up—stretching the sheet tightly over the form. When the sheet has been stretched sufficiently so that it hugs the form tightly, the pressure is released and the formed piece also is released from the block. In the stretching process the thickness of the material is reduced only from five to seven per cent. The entire operation requires but a few minutes.

**T**HE Reed-Prentice Corp., Worcester, Mass., has developed a new model vertical milling and die sinking



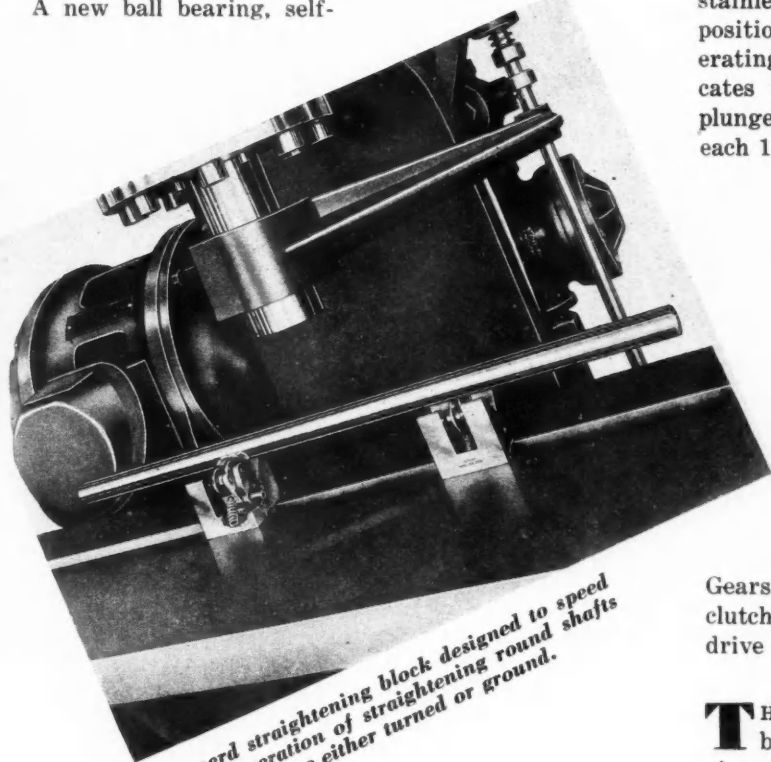
Two views of the metal stretching press built by the Engineering & Research Corp. and installed recently in the Glenn L. Martin plant near Baltimore, Md.



machine. It is designated as model No. 3VG and supersedes the company's No. 3V unit. In the No. 3VG a new design of auxiliary bracket is used incorporating a back gear assembly for obtaining slower spindle speeds than can be secured with direct belt drive. However, the back gear assembly may be omitted where not required. The same auxiliary bracket is used with direct belt drive and construction is similar to that of the No. 3V vertical milling and die sinking machine. The company has prepared a leaflet which lists spindle speeds with various motors when using open belt and back gears.

**A** NEW series of power squaring shears has been added to the line of equipment manufactured by the Niagara Machine & Tool Works, Buffalo, N. Y. The series is built in sizes ranging from 10 gage to  $\frac{1}{2}$  in. inclusive. Advantages claimed for the equipment include more working strokes per hour due to convenient arrangement of controls and gages, full visibility of cutting line, instant acting 14-point engagement sleeve clutch, complete accessibility at the rear, and the operating speeds of the shears themselves.

A new ball bearing, self-



*Greenard straightening block designed to speed up the operation of straightening round shafts that are either turned or ground.*

*Automotive Industries*



*Automatic high-speed whiteprint machine built by Ozalid Corp.*

measuring parallel back gage on the Niagara machines reads in increments of  $\frac{1}{128}$  in. Each turn of the handwheel is equal to  $\frac{1}{4}$  in. of gage bar travel, and a stainless steel scale on the gage bracket indicates the position of the gage bar to the nearest  $\frac{1}{4}$  in. The operating handwheel is equipped with a dial which indicates the gage position to the nearest  $\frac{1}{64}$  in. A plunger type indexing handle engages locking holes for each  $\frac{1}{128}$  in. of gage bar travel. The gage can be adjusted for taper cutting by loosening the "T" handle on the adjusting sleeve on the connecting shaft. A separate dial indicates the relative position of the gage at the right hand bracket for non-parallel position.

The drive mechanism, including the 14-point sleeve clutch with built-in single stroke mechanism, and all gears are enclosed in an oil-tight case. The single stroke mechanism can be disconnected for continuous operation, and a safety lock is provided to prevent engagement of the clutch when adjusting knives or gages.

Gears are mounted between anti-friction bearings, and clutch and gears operate in a bath of oil. "V" belt drive with guard is standard equipment.

**T**HE double row roller bearing recently announced by the Shafer Bearing Corp., Chicago, is available sizes from 3.1490 to 5.9045 in. bore, the "DE" 200 series, and in sizes from 1.9680 to 5.1171 in. bore, the "DE" 300 series. The "DE" series is a self-contained

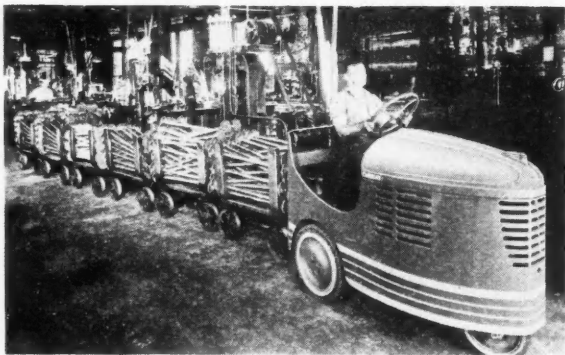
*No. 3VG Reed-Prentice vertical milling and die sinking machine. The accompanying close-up view shows the back geared spindle construction (guard removed).*

double row angular contact type. Shafer concave rollers operate between convex races, the one-piece outer race having two ground raceways. It is pointed out by the manufacturer that the concave roller design provides self-alignment within the bearing itself, and capacity for radial loads, thrust loads in either direction, or any combination of radial and thrust loads.

**C**LARK Tractor division of the Clark Equipment Co., Battle Creek, Mich., has brought out a new industrial tractor. It is capable of pulling 25 tons on trailers and is designed to negotiate crowded aisles, pass through narrow doorways, and operate on congested platforms.

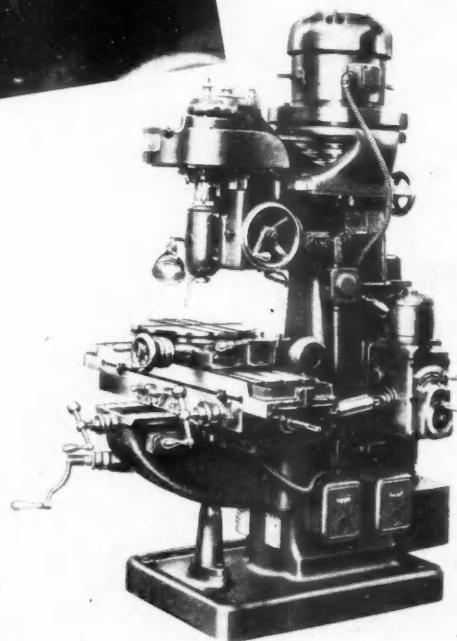
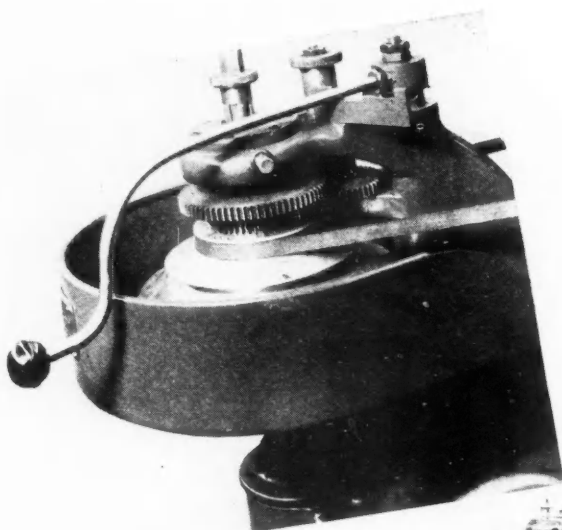
Power for the "Clarkat," as it is called, is provided by a Continental Red Seal engine and a 4 gal. gas tank affords sufficient capacity for the average day's consumption of fuel. The machine has an overall width of 38¼ in., 57-in. turning radius and speed of 8 m.p.h. Equipment includes self-starter, hydraulic brakes in rear drive wheels, air cushion tires in rear, solid in front and universal coupler operated by driver without dismounting. A heavier model for use on damp and slippery factory floors and steel ramps and for pushing heavy objects into position also is available. It pulls 40 tons on trailers.

**T**HE Ozalid Corp., New York, has designed a high-speed automatic whiteprint machine which is quite different from the conventional type of reproduction equipment. It is built to provide positive type prints, developed dry at speeds ranging up to 20 linear ft. per min. Uniform exposure is said to be assured



*"Clarkat" industrial tractor built by the Clark Tractor Division of Clark Equipment Co.*

April 1, 1940



### February Activity at 92.2 Per Cent of Capacity

February operating activity of the machine tool industry, according to the National Machine Tool Builders' Association, stood at 92.9 per cent of capacity. The Association previously reported its capacity index at 93.3 per cent in January and 93.3 per cent for December, 1939.

by the use of a single, high-pressure mercury vapor tube. This tube was developed especially for the machine.

In this machine the original and the print are separated automatically. The operator, standing in front of the machine, merely feeds the original and the sensitized material into the printer. Exposure completed, the original and the print are not only separated automatically, but the original is returned to the operator in front of the unit while the print is carried through the developer and is discharged dry and ready for use at the rear of the machine.

Either cut sheets or continuous yardage can be

*Automotive Industries*

## A Tax on Machines is a Tax on Men

In proposing a bill providing a tax differential to reward employers whose use of man-power instead of machines is greater than average, Senator O'Mahoney reveals a degree of economic foginess seldom appearing in the United States Senate. Such rewards to employers would come out of the hide of the consumer in increased prices, while the additional men employed to function inefficiently in place of machines might well be equalled by the number of workers thrown out of employment in factories now devoted to producing tools and machinery.

Paradoxically, the Wyoming Senator, in seeking a dollar incentive to manufacturers for maintaining employment at a high level, is clutching at a sound idea. But he has the cart before the horse. His bill attempts to tell the manufacturer how to maintain employment. Even if the method devised would

achieve its avowed end—which it won't—the proposed legislation would be unsound.

Intelligent and direct is the attack on this same problem that long has been urged by Gerard Swope. Reward through tax preference, Mr. Swope has been saying in essence, the employer whose payrolls fluctuate the least. The Swope approach would challenge the employer to use every means within his power and ingenuity to keep men at work. It would name the objective—stabilized employment—and then give direct reward for achievement of the objective.

There is irony in the fact that Senator O'Mahoney, author of the most unsound bit of industrial legislation to appear in a tidal wave of economic inconsistencies, should be the chairman of the Temporary National Economic Committee, engaged in analysis of our most complex economic problems.—

NORMAN G. SHIDLE

handled automatically. A speed control and a speed indicator for the full speed range of the machine are located in front of the unit. A variable transformer is included in the primary circuit of the transformer permitting variations of intensity of the lamp from full brilliancy to 60 per cent of maximum without loss of energy. The "dimming" arrangement allows the operator to select the intensity required, and is said to

permit continuous and uniform production of white-prints despite variations in tracings with corresponding savings in current.

**A**N interesting new machine is the combination test and straightening block recently put on the market by the Greenerd Arbor Press Co., Nashua, N. H.  
(Turn to page 349, please)

## Flexible Control of Push-Pull Type for COE Vehicles

**W**ITH the increasing use of cab-over-engine vehicles, the problem of controls has become a serious one, particularly that of connecting the accelerator pedal with the carburetor. The American Cable Division Chain & Cable Company, Detroit, Mich., is producing a flexible control of the push-pull type for this particular installation which it has been furnishing to two large truck manufacturers for the past year. A typical illustration is shown herewith.

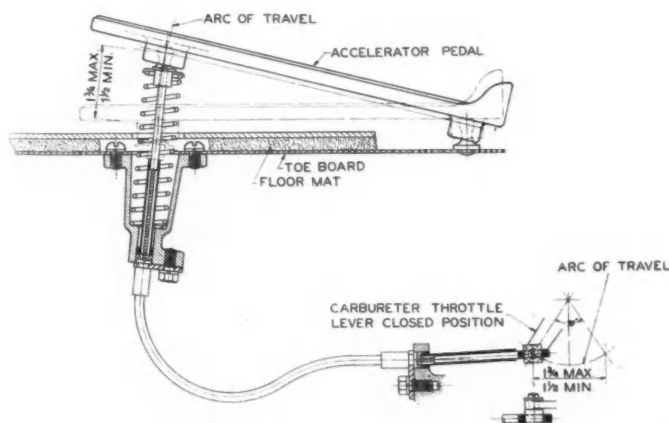
This control unit consists of a preformed inner (or operating) member, which slides within a flexible con-

duit built especially to withstand vibration, to transmit motion, from a fixed point to one subjected to various movements, such as motor rocking or oscillation. Since motor movements are not transmitted to the accelerator pedal, the position of the carburetor control lever is not affected even when driving over the roughest roads. Engine speed thus is accurately controlled by the position of the accelerator pedal.

The conduit construction, although permitting flexibility and motion, insures the exclusion of water and dirt. The accelerator control has been in production for the past few years, and with constant improvement in construction and manufacturing methods, is said to be fool-proof, trouble-free, and definitely out of the experimental stage.

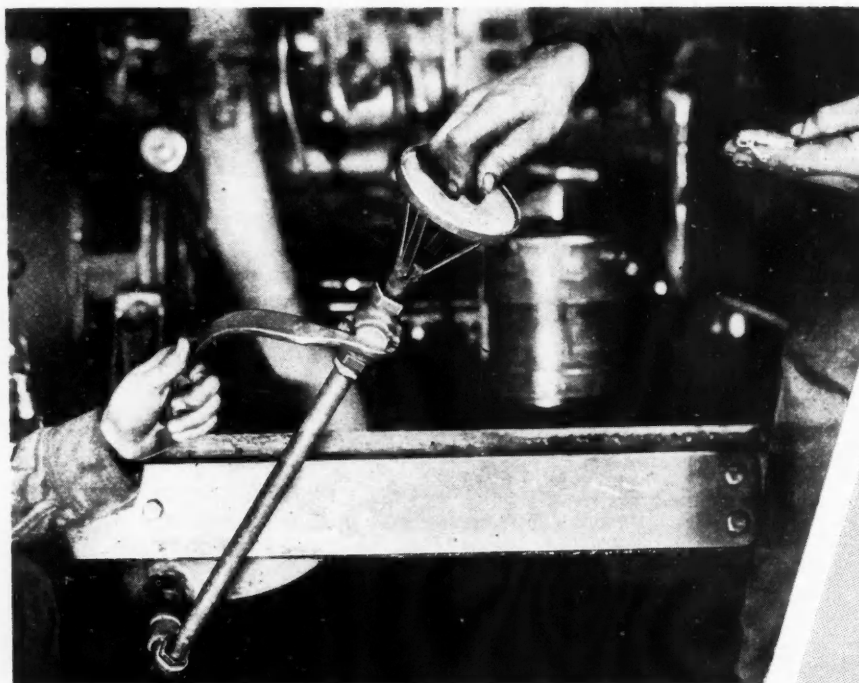
The Tru-Lay push-pull control is available also as a universal mechanism for all manner of applications where it is difficult or undesirable to use the conventional rods, cross-shafts, bell-cranks, etc. These controls are available in 1/8-in., 3/16-in., and 1/4-in. armored strand of any desired length, with a range of movement up to 4 in. Units having more than a 4-in. movement can be made up on order.

**Tru-Lay push-pull control unit**

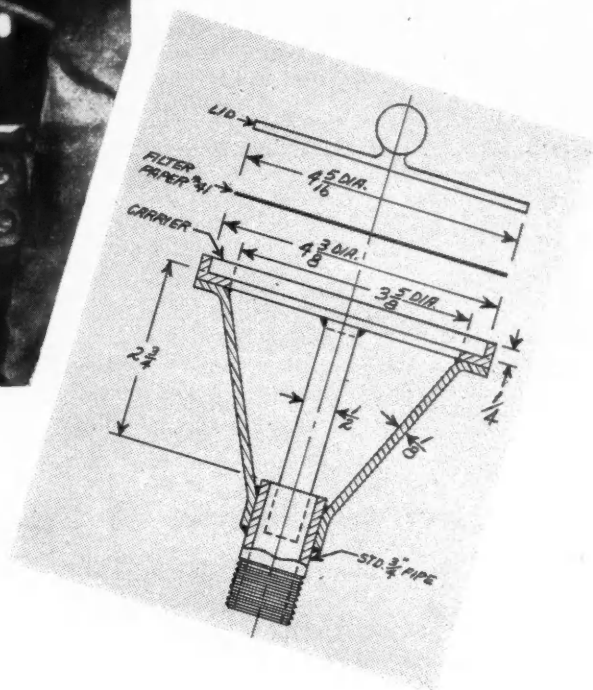




# PERFORMANCE



Two views showing the target fixture in use and its construction



**E**XPERIENCE of Surface Transportation Corporation—a New York City operating concern—with Diesel engines in buses was outlined in a paper by W. C. Cumming and C. Brettell, presented some time ago at meetings of both the Philadelphia and the Metropolitan sections of the S.A.E. The corporation has been using Diesel-equipped buses on a route which is very hard on equipment. Riding is exceptionally heavy, vehicular traffic is dense, streets are narrow, and turns are sharp. There is a continuous gradient from one terminal to the other. Two years ago Diesel-electric buses were found unsuitable for this service, but great strides have been made recently, and many of the early faults have been corrected.

Much of the trouble experienced was in connection with engine lubrication, and the authors have come to the conclusion that oils for such service should be selected on the basis of actual performance, specifications, as such, being useless. In the authors' opinion, means should be provided to keep the crankcase temperature substantially constant. It is generally conceded that paraffin-base oils are better all-around lubricants than naphthene-base, but when they are subjected to high temperatures they are inclined to "gum." Surface Transportation Corporation's specification for Diesel lubricating oil provides that it must be of a grade recommended for use in automotive Diesel engines and guaranteed free from water and sediment;

that the viscosity must not exceed 650 seconds at 100 deg. Fahr. and 60 seconds at 210 deg. Fahr.; that the Conradson carbon number must not exceed 35, and that the pour point must not be higher than zero Fahr.

No straight mineral oils had yet been found, the authors said, which would hold cylinder and ring wear within reasonable limits and at the same time prevent ring sticking. Inhibitors are used in the oil to keep the oil passages free from sludge, and carbon from collecting behind the compression rings and from filling the slots in the oil rings. Two per cent inhibitor by volume is added to all oil supplied to the crankcase, and the oil supply is changed every 4000 miles. To keep the rings free of carbon, the piston top and ring belt are "dosed" with from 1½ to 2 ounces of inhibitor every 4000 miles, while the engine is still hot from a run.

To keep down the amount of sludge in the crankcase, two stages of "full," edge-type oil filtration are used

# TEST

## *is only adequate gage for Diesel lubricants*

to remove heavy carbon and sludge, and one stage of cotton-waste partial filtration to remove water of condensation and carbon.

Cylinder wear of automotive Diesel engines—the authors' experience shows—should be approximately the same as that of gasoline engines. Owing to the higher cylinder pressures, there will be more severe blow-by in the Diesel, and this calls for better crank-case ventilation. The oil slingers or oil seals at the rear main bearing have proven inadequate. Also, where the air compressor is lubricated from the Diesel engine, the lubrication is unsatisfactory—and the compressor shows it.

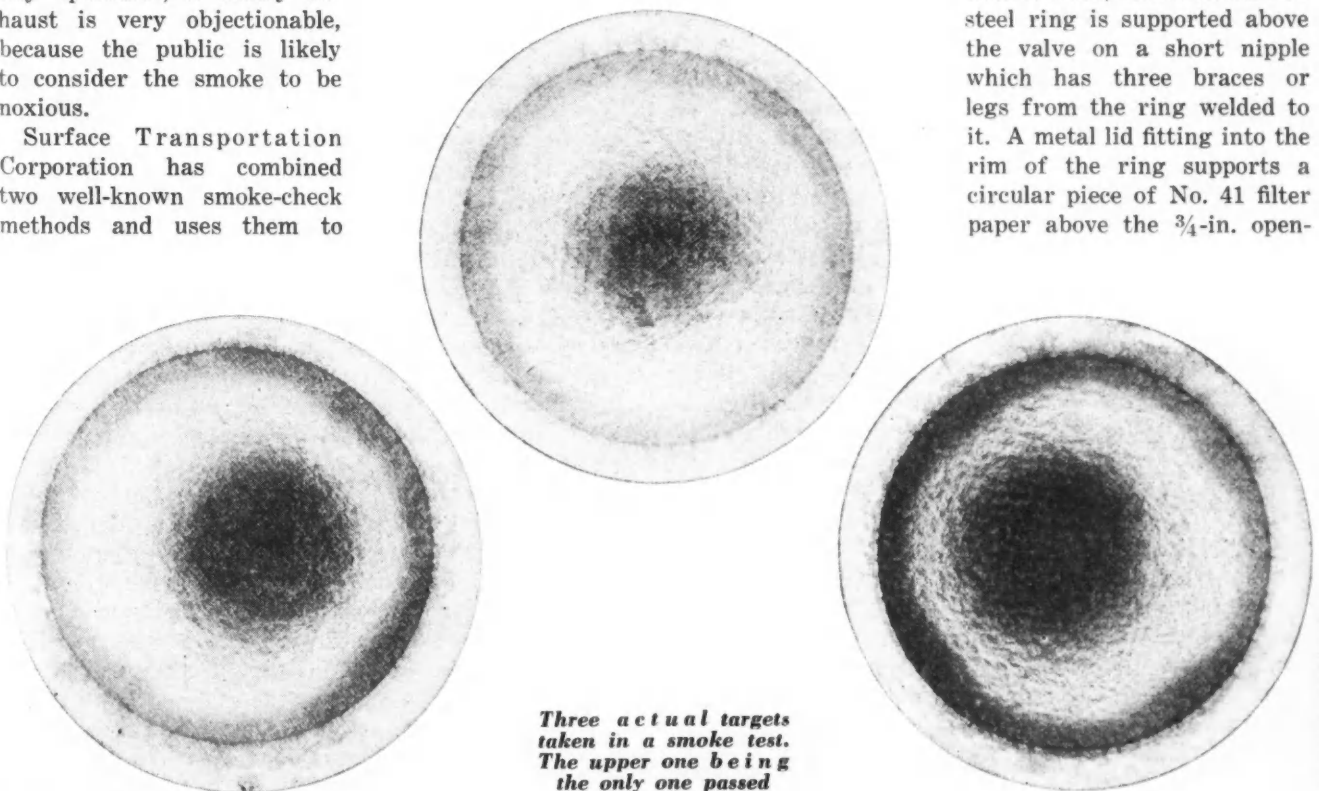
A composite fuel spray is desirable (according to the authors), consisting of a core of high penetrating quality and a skirt of finely divided particles. The dense core offsets the stripping action of the air, while the fine skirt reduces the ignition delay. While fuel viscosity has an effect on smoke in the exhaust, it is not a cure-all for this evil. In city operation, a smoky exhaust is very objectionable, because the public is likely to consider the smoke to be noxious.

Surface Transportation Corporation has combined two well-known smoke-check methods and uses them to

periodically check exhaust conditions. The first method, which has been in use by the U. S. Navy for many years, calls for a shut-off valve in the dynamometer exhaust stack, a light source, and a photronic cell suitably mounted in a cross of tubing. Both the cell and the light source are protected by glass screens, and each assembly is removable for cleaning. The density of the smoke passing through the light source is registered by the photronic cell. A maximum smoke density of 25 per cent was decided upon as acceptable.

Some means of recording the smoke density for future comparisons was considered desirable, and that is where the second method comes in. It involves the use of a  $\frac{3}{4}$ -in. pipe-plug boss welded into each engine exhaust pipe  $3\frac{1}{2}$  ft. from the exhaust manifold companion flange. When an inspection is to be made, a smoke indicator is screwed into this boss, consisting of a piece of pipe of such length as to give a chart or target not too dark and not too light. Mounted on

the pipe is a shut-off valve with a lever, and a carrier or steel ring is supported above the valve on a short nipple which has three braces or legs from the ring welded to it. A metal lid fitting into the rim of the ring supports a circular piece of No. 41 filter paper above the  $\frac{3}{4}$ -in. open-



*Three actual targets  
taken in a smoke test.  
The upper one being  
the only one passed*

ing in the shut-off valve and nipple of the fixture.

Indications are taken on a hot engine which has previously been checked on the smoke meter. First the exhaust system is cleared through the indicator valve, then the filter-paper target is fitted into the steel ring and backed up by the metal lid, and the target is then exposed for a number of seconds which has been found sufficient at the particular speed to give a readable record. The back pressure is held at the same value in all tests. Duplicate targets can be made and filed for reference. It was found that an exhaust-gas analyzer is not nearly as accurate as the smokemeter for checking combustion processes, as it is possible to pass from a clean to a foul exhaust with practically no difference in the "combustion-efficiency" reading of the analyzer.

Clean fuel at the injection apparatus is very important. In one garage of the corporation the fuel is passed through 10 stages of filtration on the dispensing pumps, and in addition there are three stages of filtration on the vehicles. Notwithstanding these precautions, vehicles will occasionally stall on the street as a result of a clogged filter.

Considerable trouble has been experienced from the "freezing" of plungers or valves in nozzle barrels, which is favored by the large temperature variations. Standard tolerances on injection nozzle fits have had to be abandoned, and one manufacturer is now experimenting with new "low" and "low-low" tolerances. Another cause of trouble was bridging over of the gap between nozzle sleeve and nozzle by carbon. In one particular engine the open ends of the sleeve are chamfered in the direction of the spray angle, and the drill hole at the nozzle tip is too small for a throttling engine, since the inevitable side spray from the pintle when closing impinges on the knife-edge chamfers of the copper sleeves and finally forms a carbon bridge across the gap. Complete cratering of all nozzle sleeves occurred within a mileage as low as 300 with some engines. Finally the sleeves were opened up in such a way that the fuel oil could not impinge upon their edges at the critical moment of valve closing, and these special sleeves are now used on all engines of the corporation.

In another make of engine the transfer pump delivers excessive amounts of fuel to the injection-pump gallery, which resulted in appreciable leakage past the plungers into the pump-shaft housing. The final results were dangerous leakage from the filler neck of the housing, excessive wear due to the low viscosity of the diluted lubricant in the housing, and a very

short life of the filter element in the final filter, since excessive amounts of fuel were filtered repeatedly and returned to the storage tank.

Thin-shell bearings of the copper-lead type sometimes lose their "spread" after a short period of service, and pinch the journal along their edges, while in other cases there will develop high spots which drag on the journals. The heat generated at such points melts out the lead, which is washed away by the lubricant under high pressure. The parts so affected look as though they had been corroded, when in reality

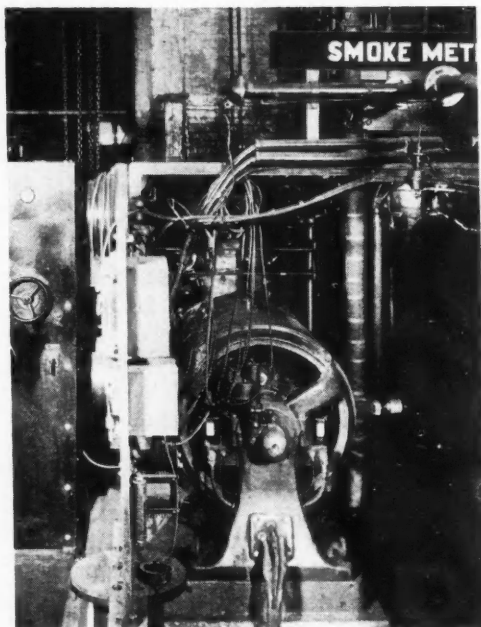
they have been simply overheated. Surface Transportation today insists on line-bored bearings in all Diesel engines, which tends to eliminate high spots.

A source of considerable trouble has been oil leakage through the rear main bearing, because all of the Diesel buses of the corporation have electric drive, and generators are direct coupled to the engines. Any oil getting into the generators not only attacks the insulation of the field coils, but lodges on all interior surfaces and accumulates dust to such an extent that it materially reduces the ventilating channels and prevents proper ventilation. The temperature then may rise to a point where the insulation is damaged, and the solder at the junction of the armature windings to the commutator may melt. The high temperature of the oil-soaked insula-

tion may even start a fire. For this reason elimination of oil leakage through the rear bearing is of far greater importance than it would be if it only increased the oil consumption and endangered the parts to be lubricated by reason of a low oil level in the crankcase.

Starting generally is effected by means of a 24-volt electric starter connected across two 12-volt batteries in series, which are automatically connected in parallel again after the starter is disengaged. Some trouble was encountered with certain makes of starter which had no means of lubricating the end bearing, and the shaft carrying the starter pinion would occasionally "gum up," with the result that the starter would fail to engage or fail to disengage. This latter failure, of course, usually proves disastrous to the starter. This trouble was eliminated to a large extent by cutting away the housing so that the bearing could be flushed with fuel oil periodically. Also, when cranking had to be continued for a considerable period in order to get the engine to start, the armature sometimes would get so hot that the soldered joints of the armature leads to the commutator bars would melt.

(Turn to page 354, please)



*Intensity of smoke is measured by a photo-electric cell in cross tube of the exhaust pipe of this engine dynamometer*



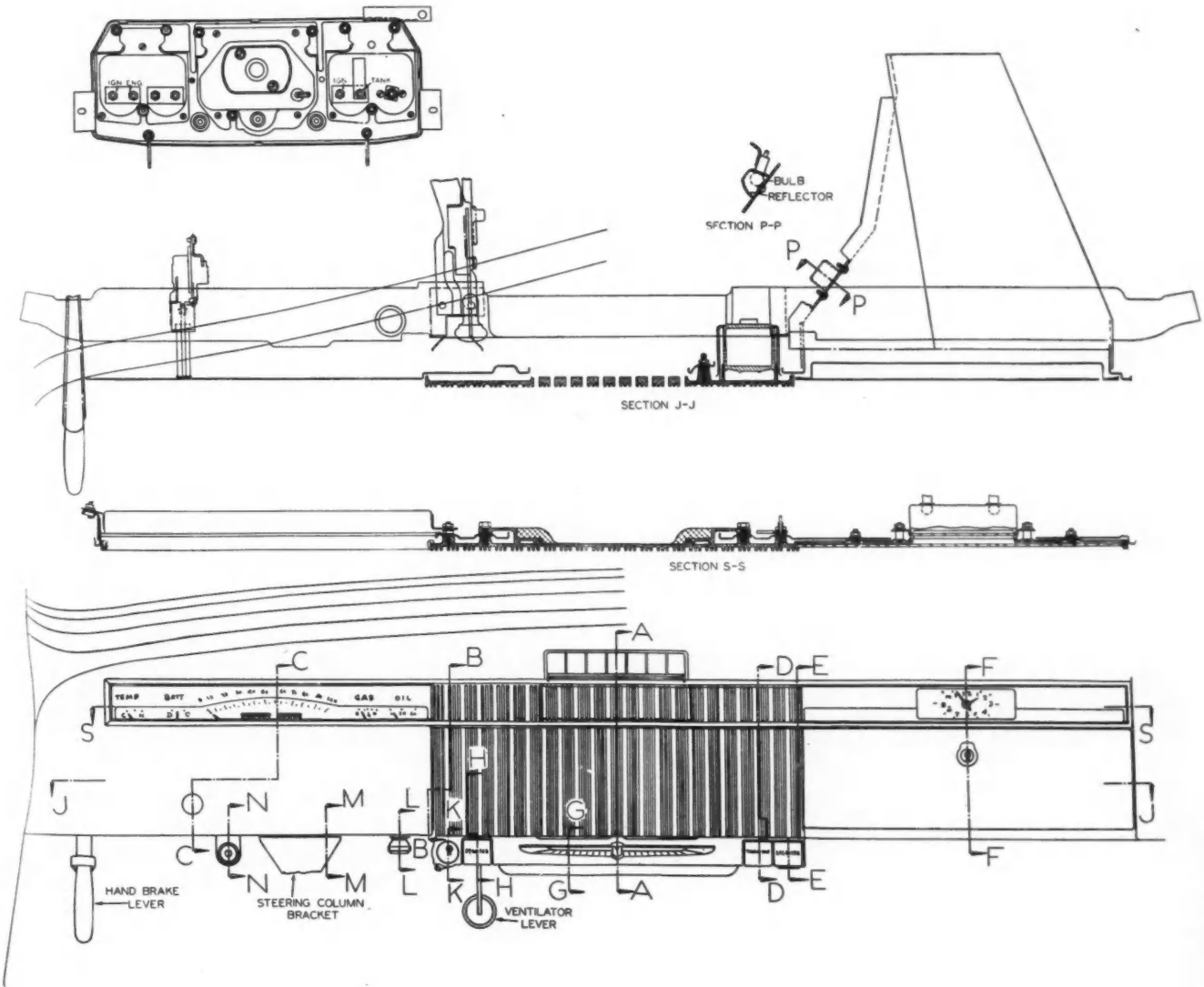
# INSTRUMENT PANEL USED ON 1940 CADILLAC AND LA SALLE MODELS

The instrument panel detailed on this and the following page is used on all 1940 models of Cadillac and LaSalle cars. In keeping with the present mode of design, all controls are smoothly curved and have been recessed for safety and neat appearance.

Color of the instrument panels on all model LaSalles and the Cadillac 62 and 60 Special matches the interior

trim; i.e., gray with gray trim and tan with tan trim. The steering wheel shifter lever knobs and other plastic parts follow the same color scheme. On the Cadillac models 72, 75 and 90, the panels are of burled walnut finish to match the garnish moldings.

As shown on the accompanying front view drawing, the chrome radio grille of vertical ripple spaced bars



## INSTRUMENT PANEL USED ON 1940 CADILLAC AND LA SALLE MODELS

is centered in the panel. When a radio is not installed, the grille bars are retained to cover the center portion. The ash receiver is concealed in the right side of the grille. Below the radio grille a bright chrome die cast panel carries the LaSalle or Cadillac crest flanked by gold wings.

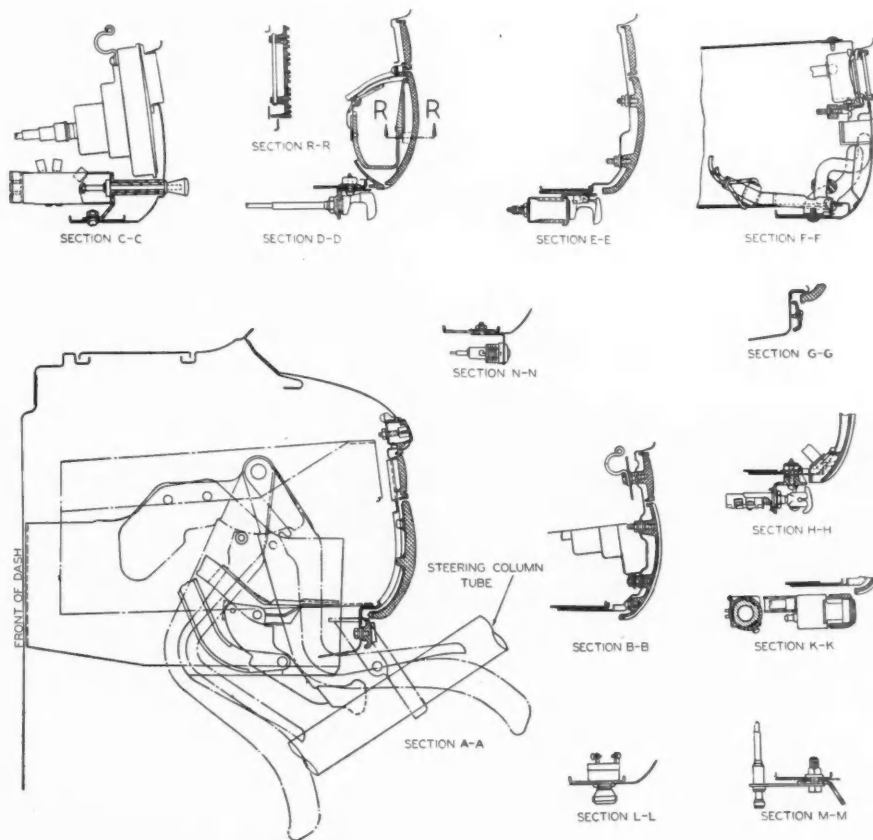
Starter button and illuminated ignition lock are placed at the left of the panel. At the right are the hand throttle and cigar lighter. All of the controls are chrome finished and marked for easy identification.

Across the top of the panel a three-division curved glass covers the instrument cluster at the left, radio dial in the center and the electric clock at the right.

Above the radio dial is a line of touch tuning buttons. A plastic cover is used in lieu of the line of buttons when a radio is not included in the equipment.

A plastic windshield wiper control knob is located behind the vee of the windshield garnish. Below the clock on the right face of the panel is a large cloth lined glove compartment with lock. Incidentally, this compartment is lighted automatically when opened.

Accessory controls are arranged on a flange under the left side of the instrument panel in such a manner as to be easily accessible to the driver. The instrument light switch includes a rheostat which provides variable light intensity.



## NEWS OF THE INDUSTRY

### Heavy NADA Opposition to FTC Trade Rules Voiced at Hearing

*Richberg Leads Attack, Emphasizing Need for A Careful Reconsideration of Proposed Rules*

United opposition of the National Automobile Dealers Association to the Federal Trade Commission's proposed trade practice rules for the automobile industry was expressed at a hearing on Mar. 20 before Henry Miller, assistant director of trade practice conferences with the result that Mr. Miller granted a request that briefs be filed within 10 days in support of the objections. Other organizations also gave notice they would file their views, most of which shared NADA opposition to the rules. Broadly it was maintained that the rules as originally drafted by NADA have been so revised by the FTC as to create vagueness and generalities, making them so inadequate that they would not serve the purpose for which they were intended by the association.

This point was particularly emphasized by Donald R. Richberg, Counsel for NADA and the Automotive Trade Association Managers, and others who appeared at the hearing.

Speaking for 45 minutes, Richberg led the attack on the rules. By speaking for these associations, Richberg stated that his remarks represented the opinions of approximately 22,000 dealers—those dealers who are connected with associations.

He stated that the associations he represented were opposed to the acceptance of the rules on the grounds that they failed entirely to accomplish those ends for which they were sought. Citing

omissions of regulations sought by the dealers, the vagueness of provisions as stated and the inclusion of prohibitions of such sweeping effect as to destroy reasonable and lawful efforts of the dealers to protect their own business, Richberg urged upon the commission the necessity for a careful reconsideration of the rules proposed. He claimed that there was practically nothing in the proposed rules calculated to have the effect of improving the relations between manufacturers and dealers, or of relieving the dealers of the inequities described in the report of the commission's investigation of the industry.

Richberg was followed by Charles W. Bishop, Counsel for NADA, and appearing for Automotive Trade Association Managers. Bishop spoke more in detail on the points upon which the greatest opposition was based, which appeared to center around the fact that the majority of the rules affected dealers in intrastate commerce, and therefore were beyond the jurisdiction of the Federal Trade Commission.

Rule 26 was singled out as being the sore point in the whole set of rules, and the foundation of the dealers' problems. It was brought out that by prohibiting any group action to develop a guide for used car values it was intimated that all such actions were illegal whereas many such actions or agreements might very well be legal and permissible under existing law.

*(Turn to page 348, please)*



**Frank Rising**

... new general manager of the Automotive Parts and Equipment Manufacturers Association, Inc., succeeding Clarence O. Skinner who resigned the office to join the labor relations staff of General Motors Corp.

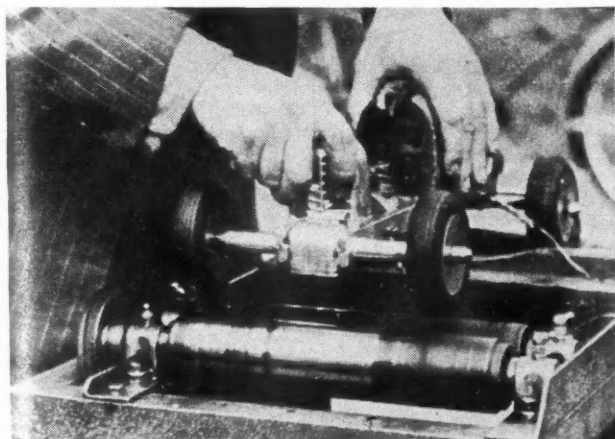
### Frank Rising Goes to APEM

Frank Rising has assumed the general management of the Automotive Parts and Equipment Manufacturers, Inc., succeeding Clarence O. Skinner, who resigned to join the labor relations staff of the General Motors Corp. Rising had been labor and management editor of *Business Week* for the past five years. He also served in a similar capacity for *American Machinist* and for *Factory Management*.

Rising also has been managing editor of *Today* (Raymond Moley's magazine) and held editorial positions on a number of newspapers. He has served as a consultant and adviser for the National Industrial Conference Board, the American Management Association and the industrial relations graduate schools of Princeton, Michigan, Stanford and Wisconsin universities.

### Westinghouse Machine Tool Forum to Be Held May 6-8

The 1940 Machine Tool Electrification Forum, an annual meeting sponsored by the Westinghouse Electric & Mfg. Co., is to be held at East Pittsburgh, Pa., May 6 to 8.



Globe

### Starter

The device shown at the left is a motor driven starter for model racing cars. Front rollers transmit the starting power, while the rollers in the rear simply provide support. Fastest known record for the miniature vehicles is 63 m.p.h. Two cycle, 1/4-hp. engines operating 1800 r.p.m. at top speed are widely used. Gear ratio is two to one.



## Passenger Car and Truck Production (U. S. and Canada)

	February 1940	January 1940	February 1939	TWO MONTHS		Per Cent Change
				1940	1939	
Passenger Cars—U. S. and Canada						
Domestic Market—U. S.	324,555	348,755	223,795	673,310	486,125	+38.4
Foreign Market—U. S.	12,817	13,981	19,205	26,798	38,340	-30.1
Canada	12,779	12,579	10,914	25,358	22,318	+13.7
Total	350,151	375,315	253,914	725,466	546,783	+32.8
Trucks—U. S. and Canada						
Domestic Market—U. S.	53,960	55,046	46,328	109,006	93,719	+16.3
Foreign Market—U. S.	12,295	14,319	13,892	26,614	27,204	-2.2
Canada	5,414	4,634	3,386	10,048	6,772	+47.8
Total	71,669	73,999	63,606	145,668	127,695	+14.0
Total—Domestic Market—U. S.	378,515	403,801	270,123	782,316	579,844	+35.0
Total—Foreign Market—U. S.	25,112	28,300	33,097	53,412	65,544	-18.5
Total—Canada	18,193	17,213	14,300	35,406	29,090	+21.8
Total—Cars and Trucks—U. S. and Canada	421,820	449,314	317,520	871,134	674,478	+29.2

## Character of Steel Operations Continues Virtually Unchanged

### Automotive Buying Plays Increasingly Important Supporting Role in Market

The steel market continues along unchanged lines, with the support extended to it by automobile manufacturers and parts makers assuming more and more importance as some of the other steel consuming industries turn their back on it. The rate of employed ingot capacity, according to the American Iron & Steel Institute, dipped during the week ended March 23, to 62.4 per cent, compared with 64.7 per cent in the preceding week. This denotes the lowest rate since the five-day labor holiday week. Before that, the rate had stood at 63 per cent, so that activity now is about what it was before the outbreak of the war in Europe.

With the exception of automobile sheets, for the finishing of which time must be allowed, nearly all descriptions of steel are available within a week after receipt of specifications and shipping instructions, so that there is little necessity of anticipating assembly needs by more than a fortnight. One of the reasons for placing orders during the last quarter of 1939, two and more months before the steel was needed, was that the supply of raw or primary steel was known to be tight, and consumers feared that, if they did not order in good time, available supplies of sheet bars, etc., might be used for rolling and finishing the specifications of earlier buyers. Present conditions are sharply different. Many steel producers are building up reserve stocks of semi-finished material, to be drawn upon when finished steel demand improves. Meanwhile competition for the business of automobile manufacturers is becoming keener, and some of the larger buyers are not losing sight of this in their appraisals of the market's future.

The kaleidoscopic changes in the

European war outlook of the past few weeks have brought much vacillation into the non-ferrous metal markets. A supposedly sharp drop in the copper requirements of the Allies and easing off in the export demand for fabricated copper and brass products caused a sudden about face in the open market for the red metal. For some time outside holders had been asking a premium over the quotation of producers, which remains at 11½ cents for spot elec-



### Repeat Performance

D. U. Bathrick (left), general sales manager of Pontiac, checks details of a scale model chassis exhibit for the Second New York World's Fair with John H. Baker, head of Pontiac's chart and display department. Incidentally, Mr. Baker is the man under whose supervision all of Pontiac's automobile show exhibits are built.

trollytic, but early in the week ended March 23, spot metal was to be had in the open market at 11½ cents. Neither mine producers nor custom smelters altered their prices. The price of scrap copper was lowered by \$5 a ton.

Tin prices also yielded ground. After  
(Turn to page 345, please)

## Dow to Double Capacity For Magnesium Production

The Dow Chemical Co. has purchased 800 acres of land with about three miles of harbor frontage on the Gulf Coast at Freeport, Tex. According to Willard H. Dow, president and general manager, the company plans a large industrial development on this site devoted principally to the utilization of sea water as a raw source for magnesium. Equipment, plant buildings, laboratories and executive offices, will involve an expenditure of approximately \$5,000,000. Construction is to start at once under the supervision of the Austin Co., Cleveland, contractors for the entire job. Completion of the plant late in the summer of 1940 will more than double the company's capacity for the production of magnesium.

In addition to Dow's main plant at Midland, Mich., which covers a site of over 500 acres and is devoted to the production of more than 400 chemical products, the company's activities are nationwide. The Great Western Division at Pittsburg, Calif., manufactures alkalis, xanthates and other chemicals; the iodine and insecticide division at Long Beach, and Venice, Calif., produces a large percentage of the United States' raw iodine requirements; Cliffs Dow Chemical Co., at Marquette, Mich., manufactures chemicals from wood; Ethyl-Dow Chemical Co., at Wilmington, N. C., extracts bromine from the ocean for use in Ethyl gasoline, and Dowell, Inc., headquartered at Tulsa, Okla., provides a chemical service for oil and gas wells.

## 1940 ASI Show in Chicago, Dec. 9 to 14

The 1940 Automotive Service Industries Show will be held Dec. 9 to 14, at the Navy Pier, Chicago. Decisions to that effect were announced by the newly-appointed joint operating committee at its initial meeting held March 18 in Chicago. The Motor and Equipment Wholesalers Association, the Motor and Equipment Manufacturers Association and the National Standard Parts Association, are the three national trade organizations sponsoring the annual after-market exposition. George N. Lockridge, of Kansas City, was elected to the chairmanship of the joint operating committee, and J. M. Spangler, of New York, was named vice-chairman.

The complete personnel of the new joint operating committee representative of the three sponsoring associa-

tions is: MEWA—G. E. Johnson, Auto Spring and Bearing Co., Roanoke, Va.; G. N. Lockridge, Kansas City Automobile Supply Co., Kansas City, Mo.; C. E. Owen, East Texas Auto Supply Co., Tyler, Tex.; W. F. Wilkerson, Wyoming Automotive Co., Casper, Wyo. MEMA—C. P. Brewster, K-D Mfg. Co., Lancaster, Pa.; B. G. Close, King Quality Products Co., St. Louis, Mo.; Malcolm McCormick, Walker Mfg. Co., Racine, Wis.; J. M. Spangler, National Carbon Co., New York City. NSPA—T. Latimer Ford, American Hammered Piston Ring Division, Baltimore, Md.; Wm. J. Menghini, Springfield Auto Supply Co., Springfield, Ill.; Franklin A. Miller, U. S. Division of Raybestos Manhattan, Inc., Manheim, Pa.; M. F. Wible, Air Land Motor Parts Co., Inc., Greensburg, Pa.

A. B. Coffman, of Chicago, was again selected by the committee to act as show manager, and Herbert Buckman, of Cleveland, to serve as secretary of the joint operating committee.

## Packard Gets \$2,000,000 Navy Contract for Engines

The Packard Motor Car Co. has been awarded a \$2,000,000 contract for the production of 1200-hp. marine engines which will be used by the United States Navy to power high-speed surface torpedo craft now under construction.

The order is an offshoot of the Navy's \$15,000,000 experimental program. A total of \$261,000 is being used by Packard in the development and testing of seven experimental powerplants. The balance, \$1,875,000, covers construction and delivery of 81 engines.

## Rim Inspections Up 28% in February

The total number of rims inspected in February by the Tire & Rim Association, Inc., is reported at 1,850,383. Compared with February, 1939, this is an increase of approximately 28 per cent. During the first two months of 1940 rim inspections aggregated 4,014,297, an increase of approximately 27 per cent over the similar period in 1939.

## Navy Contract to Electric Auto-Lite

The Navy department has awarded the Electric Auto-Lite Co., Moto-Meyer Gauge and Equipment division, La-Crosse, Wis., a contract to supply \$12,670 worth of engine gauge units.

## New Export Office for American Nickeloid Co.

The American Nickeloid Co., Peru, Ill., has established an export office at 201 North Wells St., Chicago.



### For a Modern Army

The Swiss army recently acquired this Fiat truck fitted with talking-picture equipment adaptable for indoor or outdoor performances. Three loudspeakers, one in front and two at the rear, are built into the body. In addition to the movie apparatus, there are facilities for amplifying radio programs, recorded music, and speeches. The top of the truck is designed for use as a speaker's platform.

## ADVERTISING

According to a recent survey made by *Fortune*, people have more faith in the honesty of automobile advertising than any other classification polled, with 30.6 per cent believing that the car makers use the most honest advertising. Only 3.7 per cent believe that car advertising is the least honest.

Through J. Stirling Getchell, Socony-Vacuum Oil Co., scooped competition again with large newspaper advertisements of the *S. S. Queen Elizabeth* the day she sailed into New York. The advertisements appeared about seven hours after the conception of the idea,

in time to make the editions carrying the story of the ship's sensational unannounced arrival.

Electric Auto-Lite's sparkplug division has launched a billboard campaign emphasizing the slogan, "Ignition-engineered by Ignition Engineers." It provides for the use of 3600 billboards in 415 cities.

Buick's spring program will feature three full color rotogravure advertisements to appear in newspapers with approximately 5,000,000 circulation.

Thirty advertising symbols and trademarks, including Pontiac's Indian head and Socony-Vacuum's flying horse, are being used as design motifs for women's dress goods by Princess Fabrics, Inc., New York. R. H. Macy & Co., department store, is among the outlets promoting it.

Studebaker's success in new car sales is the talk of advertising circles. Interesting display copy, use of spot radio, and a close tie-up of dealer aid material with 98 stations have been effective. Morrow Krum, Roche, Williams & Cunningham contact man, is credited with the effective tie-up.

P. E. Allan, for the past 11 years domestic sales manager of the Associated division of Tide Water Associated Oil Co., has been advanced to general sales manager of the company, with headquarters in San Francisco.

Electric Storage Battery Co., Philadelphia, announces an expanded advertising program built around the theme of dependable service. A large range of business and technical papers, as well as newspapers and general circulation magazines, will be used.

Pontiac is using localized copy on billboards, headlined "Glad I Live In (name of state)." A total of 6500 billboards in 795 cities in every state will be used. MacManus, John & Adams, Detroit, is the agency.

## Monthly Motor Vehicle Production

(U. S. and Canada)

	PASSENGER CARS		TRUCKS		TOTAL MOTOR VEHICLES	
	1940	1939	1940	1939	1940	1939
January.....	375,315	292,869	73,999	64,093	449,314	356,962
February.....	350,151	253,914	71,669	63,606	421,820	317,520
2 Months.....	725,466	546,783	145,668	127,699	871,134	674,482
March.....		312,392		77,103		389,495
April.....		286,200		68,066		354,266
May.....		249,455		63,793		313,248
June.....		257,289		66,964		324,253
July.....		155,850		62,644		218,494
August.....		62,475		40,868		103,343
September.....		165,119		27,559		192,678
October.....		259,610		65,078		324,688
November.....		295,134		73,407		368,541
December.....		385,295		83,825		469,120
Total.....		2,975,602		757,006		3,732,608

## Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES

Renewed moderate recession in general business activity, after a brief interruption, is indicated. *The New York Times* seasonally adjusted index for the week ended March 9 declined to 96.0 per cent of the estimated normal from 96.8 in the preceding week, when a gain of six fractional points was recorded. *The Journal of Commerce* unadjusted index, after similar fluctuations, stood at 94.7 per cent of the 1927-29 average, as against 86.3 a year ago.

Retail trade reflected the stimulus due to Easter, with sales totals ranging, according to Dun & Bradstreet estimates, from six to 12 per cent above levels a year ago—the widest such margin reported since early January. Department store sales during the week ended March 9 were 11 per cent greater than the corresponding 1939 total, according to the Federal Reserve compilation, as compared with a similar excess of six per cent for the week before.

Production of electricity by the light and power industry declined by less than the usual seasonal amount during the week ended March 9 and was 10.1 per cent greater than the comparable output last year.

Railway freight movement during the same period declined moderately after a substantial gain in the preceding week. Car loadings numbered 620,997, as compared with 595,032 a fortnight earlier, and were 5.5 per cent more than the corresponding 1939 total.

Bank debits to individual accounts in leading cities during the week ended March 13 were six per cent below the total for the week before and

four per cent below the comparable amount last year.

Crude oil production during the week ended March 9 averaged 3,828,550 barrels daily, exceeding by 329,000 barrels the required output as computed by the Bureau of Mines; the similar rate of excess production in the preceding week was 269,250 barrels.

Average daily output of bituminous coal during the same period was 1,378,000 tons, as compared with 1,467,000 tons for the week before and 1,333,000 tons a year ago.

Business failures during the week ended March 7 numbered 280, according to the Dun & Bradstreet report, as against 270 in the preceding week and 286 in the corresponding period last year.

Cotton-mill activity held steady in the week ended March 9, maintaining the contra-seasonal gain reported for the week before. *The New York Times* adjusted index was unchanged at 138.4, as compared with 120.9 a year ago.

Professor Fisher's index of wholesale commodity prices remains relatively stable, standing for the week ended March 16 at 84.3 per cent of the 1926 average, the same level that was reported four weeks ago.

Excess reserves of the member banks of the Federal Reserve System rose \$50,000,000 during the week ended March 13 to an estimated new peak of \$5,780,000,000. Business loans of the reporting members on that date totaled \$4,367,000,000, or \$573,000,000 more than the corresponding amount last year.



Harold G. Smith

... who has been appointed chief engineer of the engine division of the Buda Co., Harvey, Ill.

two American plants in Japan (which represent an investment of Y24,000,000) have been reduced to less than 100 for each, and imports of replacement parts are becoming more difficult from month to month. The shortage of parts has given rise to a new racket: the abducting of parked cars and their dismantling for parts.

On Feb. 1, imports of cars and trucks and their engines into Manchukuo became a monopoly of the Dowa Automobile Company, a subsidiary of the Manchuria Industrial Development Company. Tires and chains, not yet coming under the new control system, will be shortly added to the list, it is understood. The following articles, however, are excluded from Dowa's

## Lapsing of Treaty Hampers Japan's Expansion Program

Although American-Japanese Trade Continues, a Definite Retardation of Enthusiastic Automotive Plans Is Reported

Since the United States' denunciation of the 29-year-old American-Japanese Treaty of Commerce and Navigation became effective on Jan. 26, American-Japanese trade has been on a treatyless basis. During the six-month respite between abrogation and actual expiration Tokyo pressed hard for a *modus vivendi*, and our Tokyo correspondent observes that it is significant that the Tokyo industrial press discussed, as a means of pleasing the Americans most effectively, better treatment of American automotive interests in Japan. The implicit argument was that U. S. public and government attach a much greater importance to automotive exports in the Far East than an entirely unrestricted market could possibly justify, and that the small sacrifice in exchange would be amply compensated by a large amount of goodwill.

The Japanese, however, usually do not make diplomatic presents without being assured of a return gift, and

since the treaty has now lapsed for good, everything remains as before. Monthly assembling operations by the

### New Car Registrations and Estimated Dollar Volume by Retail Price Classes\*

	UNITS				ESTIMATED DOLLAR VOLUME			
	January		Per Cent of Total		January		Per Cent of Total	
	1940	1939	1940	1939	1940	1939	1940	1939
Chevrolet Ford and Plymouth.	141,756	113,972	54.48	56.10	\$108,300,000	\$83,400,000	47.92	48.15
Others under \$1,000.....	83,285	69,020	32.01	33.97	75,600,000	63,700,000	33.45	36.78
\$1,001 to \$1,500.....	32,797	17,811	12.60	8.77	37,300,000	21,200,000	16.51	12.24
\$1,501 to \$2,000.....	1,449	1,119	.56	.55	2,500,000	1,800,000	1.11	1.04
\$2,001 to \$3,000.....	899	1,165	.34	.57	2,200,000	2,700,000	.97	1.56
\$3,001 and over.....	16	88	.01	.04	80,000	400,000	.04	.23
Total.....	260,202	203,175	100.00	100.00	\$225,980,000	\$173,200,000	100.00	100.00
Miscellaneous.....	14	37						
Total.....	260,216	203,212						

\* All calculations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new registrations of each model. The total dollar volumes are then consolidated by price classes.



control: motors, dynamos, electric batteries, electric bulbs, ball bearings, hand horns, and brake linings.

Though American-Japanese trade continues, treaty or not, there are already unmistakable indications that Japanese automotive expansion plans have suffered a setback as a result of the treatyless situation. The abrogation of the treaty has removed the last legalistic obstacles to an American embargo on exports of "implements of war" to Japan. The trouble is that nobody knows whether an embargo will come, and when; and when it comes, whether "implements of war" will be defined to include metal-working machinery. In view of this uncertainty, both Japanese buyers and American sellers of machine tools are sitting pat, awaiting further developments. The lengthening American delivery terms have added to the caution, for who knows with certainty how things will go six months hence?

The Toyota Automobile Co. has been authorized to establish a subsidiary, the Toyota Steel Manufacturing Co. The new concern will be capitalized at Y17,000,000.

The Tokyo Automobile Industry Co., Japan's oldest maker of army trucks and armored cars, has been authorized to increase its capitalization from Y33,325,000 to Y70,000,000.

The Ishikawajima Shipbuilding Co. has earmarked a fund of Y10,000,000 for expansion of its Yokohama aircraft engine plant.

Two companies allied with the automobile and aircraft industries will shortly make their *début* in Mukden, Manchukuo.

One of the projected firms is the Manchuria Internal Combustion Engine Manufacturing Co., which will be a Y5,000,000 concern incorporated under Manchukuo laws. It will be a sister concern of the Japan Internal Combustion Engine Co.

The other projected firm is the Manchuria Piston Ring Co., a subsidiary of the Japan Piston Ring Co.

## New Passenger Car Registrations

	January	December	January	Per Cent Change, January 1940 Over 1939	PER CENT OF TOTAL, JANUARY		THREE MONTHS MODEL YEAR		Per Cent Change
	1940	1939	1939		1940	1939	1940	1939	
Chevrolet.....	65,945	64,819	46,471	+ 42.0	25.34	22.87	190,284	150,455	+ 26.2
Ford.....	42,824	45,285	37,541	+ 14.1	16.46	18.48	134,114	104,127	+ 28.9
Plymouth.....	32,987	16,875	29,960	+ 10.1	12.68	14.74	61,634	97,252	- 36.6
Buick.....	23,108	24,585	15,838	+ 46.0	8.88	7.79	74,556	53,669	+ 39.0
Dodge.....	16,514	9,776	15,587	+ 6.0	6.35	7.68	29,860	43,656	- 31.6
Pontiac.....	16,203	18,508	11,505	+ 41.0	6.23	5.66	52,452	37,245	+ 40.8
Oldsmobile.....	14,141	16,797	11,419	+ 24.0	5.43	5.62	47,718	36,822	+ 29.8
Chrysler.....	7,374	3,694	5,877	+ 25.5	2.83	2.89	13,252	16,674	- 20.5
Studebaker.....	7,147	8,422	3,500	+104.0	2.75	1.72	24,310	12,968	+ 87.5
Mercury.....	6,734	7,468	4,510	+ 49.2	2.59	2.22	20,863	11,345	+ 84.0
Hudson.....	5,737	7,671	3,560	+ 61.0	2.20	1.75	22,079	12,967	+ 70.0
Packard.....	5,271	6,858	3,088	+ 70.7	2.03	1.52	20,098	12,155	+ 64.8
DeSoto.....	5,137	2,914	3,952	+ 30.0	1.97	1.94	10,070	12,037	- 17.0
Nash.....	4,335	4,777	3,900	+ 11.0	1.67	1.92	13,956	9,504	+ 46.9
Lincoln.....	2,008	2,123	1,938	+ 3.3	.77	.95	6,034	5,300	+ 13.7
La Salle.....	1,741	2,466	1,794	- 3.0	.67	.88	6,943	6,398	+ 8.4
Willys.....	1,678	1,817	978	+ 71.6	.64	.49	5,602	2,900	+ 93.0
Cadillac.....	1,144	1,479	1,282	- 10.8	.44	.63	3,890	3,938	- 1.0
Bantam.....	78	82			.03		229		
Crosley.....	51	49			.02		158		
Graham.....	37	48	350	- 89.5	.01	.17	145	1,064	- 86.3
Hupmobile.....	8	7	61	- 87.0	*	.03	28	162	- 82.8
Fiat.....	5	7			*		14		
Miscellaneous.....	9	17	101	- 91.0	*	.05	42	400	- 89.5
<b>Total.....</b>	<b>260,216</b>	<b>246,544</b>	<b>203,212</b>	<b>+ 28.1</b>	<b>100.00</b>	<b>100.00</b>	<b>738,331</b>	<b>631,038</b>	<b>+ 17.0</b>
Chrysler Corp.....	62,012	33,259	55,376	+ 12.1	23.83	27.25	114,816	169,619	- 32.3
Ford Motor Corp.....	51,566	54,876	43,989	+ 17.1	19.82	21.65	161,011	120,772	+ 33.7
General Motors Corp.....	122,282	128,654	88,309	+ 38.0	46.99	43.45	375,843	288,527	+ 31.0
All Others.....	24,356	29,755	15,538	+ 56.8	9.36	7.65	86,661	52,120	+ 66.8

\* Less than .01 per cent, but all three combined add to approximately .01 per cent.

## PUBLICATIONS

Two new educational publications issued by the American Automobile Association are: 1. "Driver Education and Training Manual for High School Teachers," price 25 cents, and 2. "State Regulation of Safety Education in the United States," price 10 cents.

An analysis of the purposes, objectives and limitations of the Motors Holding Plan for the information of General Motors dealers has been prepared in booklet form by General Motors Corp.

The Cantrell station wagon for 1940, produced exclusively on the Chevrolet passenger car chassis, is described in a folder issued by J. T. Cantrell & Co., Huntington Station, N. Y.\*

The Lewis-Shepard Sales Corp., Watertown, Mass., has announced publication of its silver anniversary edition of "Lewis-

Shepard Engineering," Catalog No. 21, which covers more than 175 items in the Lewis-Shepard line of materials handling equipment.\*

The "Motorist's Handbook and Buyer's Guide" is a new General Motors' publication which reports results of survey studies referred to as the Proving Ground of Public Opinion. Included are numerous suggestions designed to aid the prospective purchaser of a motor vehicle in making his selection of a new car.\*

"Smash Hits of the Year is the title of a booklet containing street and highway accident data which has been prepared by the Travelers Insurance Co., Hartford, Conn.\*

The 1940 edition of the Johnson Bronze Co.'s general catalog has just been produced. Identified as Catalog 400, it lists and describes more than 800 sizes of plain bearings with over 350 listings of bronze bars.\*

"Gadgets" by Townsend" is the title of a folder published by the Townsend Co., New Brighton, Pa. It illustrates metal items that are headed, threaded, collared, shouldered, knurled, tapered, grooved or pointed in various combinations.\*

"Labor Trends and Their Effect on Transportation" is the title of an appendix to the brochure "Transportation of Tomorrow" (previously listed in this column) which has been published by the Truck Equipment Co., Inc., Buffalo, N. Y.\*

A booklet entitled "Visual Aids in Safety Education" has been prepared by the Safety Education Projects, Research Division, National Education Association, Washington, D. C. Copies are available at 27 cents each.

Malleable Founders' Association has published in booklet form a paper presented at the World Automotive Engineering Congress. Title is "Developments in Malleable Iron Practice and Their Automotive Applications.\*

\*Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

### R. E. Clingan

R. E. Clingan, Chicago district sales manager of the Jones & Lamson Machine Co., Springfield, Vt., died March 11 in St. Petersburg, Fla. He was 60 years old.

## New Truck Registrations

	JANUARY	DECEMBER	JANUARY	Per Cent Change, January 1940 Over 1939	PER CENT OF TOTAL JANUARY	
	1940	1939	1939		1940	1939
Chevrolet.....	15,997	13,713	13,615	+ 17.5	35.05	36.10
Ford.....	13,282	11,532	10,168	+ 30.3	29.10	27.01
International.....	5,538	4,933	4,709	+ 17.6	12.13	12.49
Dodge.....	4,345	1,860	4,002	+ 8.5	9.52	10.61
G. M. C.....	3,142	2,771	2,384	+ 31.9	6.88	6.32
Plymouth.....	718	309	507	+ 41.6	1.57	1.34
Mack.....	572	508	482	+ 16.8	1.25	1.28
Diamond T.....	536	508	378	+ 42.0	1.17	1.00
White.....	422	287	333	+ 28.9	.92	.88
Willis-Overland.....	173	174	88	+ 96.5	.38	.23
Federal.....	153	202	85	+ 80.0	.34	.23
Autocar.....	143	106	143		.31	.38
Dioco.....	143	149	75	+ 90.8	.31	.20
Brookway.....	117	121	127	- 8.0	.26	.34
Studebaker.....	85	86	169	- 49.7	.19	.45
Hudson.....	56	38	47	+ 19.1	.12	.12
Bantam.....	38	37	33	+ 15.1	.08	.09
F. W. D.....	27	16	25	+ 17.4	.06	.06
Sterling.....	22	16	25	+ 12.0	.05	.07
Indiana.....	12	5	15	- 20.0	.03	.04
Reo.....	11	8	168	- 93.5	.02	.44
Miscellaneous.....	118	79	119	- 1.0	.26	.32
<b>Total.....</b>	<b>45,650</b>	<b>37,460</b>	<b>37,715</b>	<b>+ 21.0</b>	<b>100.00</b>	<b>100.00</b>

## AUTOMOTIVE INDUSTRIES

### Summary of Automotive Production Activity

**BUSES** Very little change with manufacturing operations holding steady. Prospects for coming months generally regarded as favorable.

**TRUCKS** Large builders have noted decided improvement in general business conditions since the first of the year. Opinion expressed that this improvement will be factor in increased truck sales. Several factories have stepped up production schedules. Fleet purchases still major factor.

**TRACTORS** While there has been a slight tapering off by some makers, production in general is still at a fairly high level. Output in some cases mainly to take care of dealers' stocks which have been exhausted by early and unanticipated buying by farmers. Newer models with higher compression engines are getting very favorable reception.

**AUTOMOBILES** Output of cars and trucks during March estimated at approximately 450,000. With March production the first half of the 1940 model year was completed. An estimated 2,500,000 units can be credited to this six-month period.

**MARINE ENGINES** Production of heavier marine engines, especially Diesels, is in full swing and one manufacturer reports that the first half of the year will show a good improvement over 1939, if the present trend of buying is maintained.

**AIRCRAFT ENGINES** Heavy production schedules continue, with some rumors of additional plant expansion.

*This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.*

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## Ruling on Compensation for Chrysler Workers Due April 1

**Benefits Growing Out of 55-Day Strike Last Fall Still Unpaid; NLRB Poll in 59 GM Plants to Be Held April 17**

Twenty-two thousand Chrysler employees still were without unemployment compensation benefits growing out of the 55-day strike last fall pending an appeal to be ruled on April 1 by the appeal board of the Michigan Unemployment Compensation Commission, while 135,000 General Motors workers awaited the National Labor Relations Board poll set for April 17 at 59 plants to determine which, if any, union shall be their bargaining agent.

The Michigan Appeal Board was to rule April 1 on three appeals, filed by the Chrysler Corp., the UAW-CIO and the UAW-AFL, against the award of Referee Charles Rubinoff, which granted \$3,000,000 in unemployment benefits to 22,000 of the 41,000 workers involved in last fall's labor dispute. The Michigan commission originally had denied benefits to any Chrysler workers, ruling they were ineligible.

The Chrysler Corp. appealed Rubinoff's decision on the grounds that all Chrysler workers were directly interested in the stoppage of work and, therefore, none of them should be granted compensation. The UAW-CIO appeal was based on the premise that all workers in the three Dodge plants should not be denied benefits when only a few workers in those plants were directly involved in the dispute. Rubinoff's decision had ruled out benefits for any workers in the Dodge main, truck and forge plants where the strike centered, while allowing benefits to employees in seven other Chrysler plants

where work was stopped due to lack of material.

The UAW-AFL appealed on the grounds that its members in the three Dodge plants had been denied compensation even though they belonged to a rival labor organization and were not directly interested in the strike.

The commission appeal board, which is composed of Chairman Calvin N. Smith, Charles Loughheed and Charles A. Roxborough, denied the right of the Michigan Manufacturers Association to intervene in the case. Ernest Goodman, UAW-CIO attorney, was upheld in his contention that the manufacturers association was not an interested party involved in the case and therefore

was precluded from filing an appeal under the state law. Counsel for the association had maintained that its membership of 1300 constituted 90 per cent of the manufacturers paying into the fund and held that consequently it was an interested party.

Voting in the General Motors election, largest in NLRB history, will take place during working hours in the company plants. The board has received the fullest cooperation of the corporation in setting up the election machinery for April 17, according to Frank H. Bowen, regional director for the NLRB.

The UAW-CIO has filed the requisite 60-day notice of its intention to amend the original General Motors contract of 1937. The 60-day period will expire early in May. Hearings on UAW-CIO petitions for elections at the Chevrolet commercial body plant in Indianapolis and the Delco radio plant at Kokomo, Ind., which were not included among the original 59, will be heard April 1 by the NLRB. Five UAW-AFL craft unions have filed petitions at those plants.

## C. E. Wilson to Address Foundrymen's Association

The main event of the forty-fourth annual convention of the American Foundrymen's Association (Chicago, May 6 to 10) will be the board of awards address by Charles E. Wilson, executive vice-president, General Motors Corp. Mr. Wilson will discuss industrial relations.

## Reo Plans to Start 1940 Production Early in May

Reo Motors, Inc., will not get into production on its 1940 model trucks and buses before early May, probably May 15, according to Frank Morgan, sales manager. Materials and supplies are now moving into the Lansing plant and sub-assemblies soon will get under way. When full production starts about June 1 the daily output will be 40 trucks per day and the plant will have 1000 employees on its payrolls.

## Estimated Dealer Stocks of New Passenger Cars

	1939	January	February	March	April	May	June
Production—U. S. Domestic Market †	262,330	223,795	279,148	257,056	222,909	233,311	
Retail Sales—U. S. ‡	180,692	165,865	276,364	265,992	276,719	254,604	
Change in Inventory		+81,638	+57,930	+2,784	-8,934	-53,810	-21,293
Inventory, first of month		261,980	343,618	401,548	404,332	395,398	341,586
1939 (continued)		July	August	September*	October*	November*	December*
Production—U. S. Domestic Market †	142,346	56,245	155,430	239,150	272,747	357,712	
Retail Sales—U. S. ‡	229,873	166,172	139,222	236,584	257,398	274,233	
Change in Inventory		-87,527	-109,927	+16,208	+2,566	+15,349	+83,479
Inventory, first of month		320,295	232,768	122,841	139,049	141,615	156,964
1940		January*	February*	March	April	May	June
Production—U. S. Domestic Market †		348,755	324,555				
Retail Sales—U. S. ‡		239,509	236,856				
Change in Inventory		+109,246	+87,699				
Inventory, first of month		240,443	349,689	437,388			

†—U. S. Census Bureau. ‡—Automobile Manufacturers Association. \*—Revised.

## Henry Doesn't Make Them Anymore

Editor, AUTOMOTIVE INDUSTRIES:

I am a rural carrier at Ravenna, Neb., and am naturally interested in knowing what automobiles will and will not do. We need cars for tough, muddy and snow-filled roads. Cars with clearance and also a car to run economically both in gas and oil mileage. Cars that will run for years and stand the test without many repairs. Simple construction but well built. I know the Model A Ford is the best but Henry doesn't make them now.

J. T. D.

## Ourselves & Government

### A Check List of Federal Action Corrected to Mar. 25

#### FEDERAL TRADE COMMISSION

**FAIR TRADE PRACTICE RULES.** Hearing on proposed FTC rules held March 20. (See story page 337.)

**F.O.B. PRICE CASE**—Trial examiner's report next development expected in the Ford case. Testimony closed in GM case with trial examiner's report, commission's brief and respondent's reply brief all filed.

**VS. GENERAL MOTORS**—Trial examiner's report due. Case involves FTC charge that GM dealers are re-

quired to handle GM parts exclusively.

**VS. AUTOMOTIVE TRADE ASSOCIATIONS**—Counsel for the FTC and for the respondents are negotiating a stipulation, which if agreed upon will result in the issuance of a cease and desist order or a dismissal. Involved are the National Standard Parts Association, the Motor and Equipment Wholesale Association, both national organizations, and three mid-Western regional associations which were charged in October, 1936, in an FTC complaint with allegedly forming a combination to control the market and maintain resale prices.

## January Financing 35.3% Over '39 Mark

The dollar volume of retail automobile financing for January, 1940, according to the Bureau of the Census, Department of Commerce, amounted to \$110,576,769, an increase of 35.3 per cent as compared with January, 1939, and an increase of 61 per cent as compared with January, 1938. The volume of wholesale financing for January, 1940, amounted to \$189,184,307, an increase of 36.2 per cent compared with January, 1939, and an increase of 133.4 per cent as compared with January, 1938.

## THESE OIL COMPANIES NOW SUPPLY "dag" COLLOIDAL GRAPHITE LUBRICANTS-

# TO INDUSTRY

Discovery by many, many industrial concerns of just what is meant when we say that "dag" Brand colloidal graphite is a **HIGH TEMPERATURE LUBRICANT** is reflected by the oil companies now serving the demand with special oils containing this stand-by solid lubricant. "Dag" can be stably dispersed in low viscosity and volatile fluids such as spindle oils, kerosene, carbon tetrachloride, etc., thus cutting to a minimum flake off, carbon and wear. We recommend the use of this lubricant in applications where temperature conditions are beyond the generally considered limits of oil-500°F. and above. And, incidentally, when you have need of a good penetrating oil, a number of these companies have one available. The extremely fine particle size of the graphite assures ready penetration between the closest fits and the lubricating value of this solid lubricant remains long after the carrier fluid has been consumed.

Ask your oil supplier about his colloidal graphited lubricants and write us for high temperature Bulletin 130 D.

**ACHESON COLLOIDS CORPORATION**  
PORT HURON, MICHIGAN



## CALENDAR

### Conventions and Meetings

- International Acetylene Association, Convention, Milwaukee, Wis., April 10-12
- Chamber of Commerce of the United States, Annual Convention, Washington, D. C., April 29-May 2
- American Society of Mechanical Engineers, Spring Meeting, Worcester, Mass., May 1-3
- American Foundrymen's Association, Convention, Chicago, May 6-10
- SAE National Production Meeting, Hartford, Conn., May 7-8
- SAE Summer Meeting, White Sulphur Springs, W. Va., June 9-14
- Automotive Engine Rebuilders Association, Convention, St. Louis, Mo., June 10-13
- American Society for Testing Materials, Annual Convention, Atlantic City, N. J., June 24-28
- National Automobile Dealers Association, Convention, Pittsburgh, Pa., Jan. 20-23, 1941

### Shows at Home and Abroad

- National Automobile Show, Grand Central Palace, New York, Oct. 12-19
- National Metal Congress & Exposition, Cleveland, O., Oct. 21-25
- Automotive Service Industries Show, Chicago, Dec. 9-14



## Crude Rubber Consumption In February Down 9.4%

According to statistics released by The Rubber Manufacturers Association, Inc., it is estimated that rubber manufacturers in the United States consumed 49,832 long tons of crude rubber during the month of February. This represents a 9.4 per cent decrease under the 54,978 long tons consumed in January, 1940, but is 17.6 per cent above February, 1939, when 42,365 long tons were consumed.

Gross imports for February, as reported by the Department of Commerce,

were 43,088 long tons, representing a 40.6 per cent decrease under the January figure of 72,496 long tons but were 18.1 per cent over the imports for February, 1939, which amounted to 36,490 long tons.

Total domestic stocks are estimated by the Association at the end of February to be 148,776 long tons, a decrease of 5.1 per cent under the stocks on hand at the end of January, which were 156,830 long tons and 31.6 per cent under the stocks of 217,534 long tons on hand at the end of February, 1939.

Crude rubber afloat to United States ports on Feb. 29 is estimated to have

been 112,257 long tons, which compares with 90,285 long tons reported afloat as of the end of January, and 55,814 long tons afloat Feb. 28, 1939.

Reclaimed rubber consumption for February is estimated at 17,019 long tons, production at 19,060 long tons, and stocks on hand Feb. 29, 1940, at 27,019 long tons.

## Federal Augments Line with 4 New Heavy-Duty Trucks

The Federal Motor Truck Co. has announced four new heavy-duty models at rated capacities from 3½ to 7½ tons. The Model 35, rated at 3½-5 tons, is powered with a 6MKRF Waukesha six-cylinder, seven-bearing engine with 381 cu. in. displacement, 4½-in. bore by 4¾-in. stroke, and developing 105 hp. at 2600 r.p.m. Completing the unit power plant is a W. C. Lipe 13-in. single dry plate clutch and a Clark 205V five-speed transmission.

The frame is 10 in. deep. Axles are Timken with bevel drive rear. Hydraulic brakes, amplified by a vacuum booster, are 16-in. diameter by 3-in. wide front and 17¼-in. diameter by 4-in. wide rear.

The other new models include the 45, rated 4-6 tons; the 55, rated 5-6½ tons; and the 55H, rated 5-7½ tons. All are powered with Waukesha engines, the 6MKRF-381 cu. in. displacement being used in the Model 45 and the 404 cu. in. 6MZRF in the 55 and 55H models. All of these models also have the W. C. Lipe 13-in. single dry plate clutch, Clark 270V five-speed transmission and a 10-in. frame.

Axles front and rear are Timken. The Model 45 has a 58301H bevel drive rear axle, while the 55 and 55H models have double reduction drive, the former being equipped with the 75743H axle and the latter with the 76736H axle. Tubular radius rods with ball and socket joints are employed on the 55 and 55H Models. Other features of the 45, 55 and 55H Models include hydraulic brakes with vacuum boosters and Ross cam and lever type steering gears.

All models are built in eight wheel-base lengths as follows: 140 in., 150 in., 162 in., 172 in., 184 in., 197 in., 210 in., 224 in. Corresponding loading spaces (back of cab to end of frame) are: 93 in., 103 in., 115 in., 144 in., 168 in., 192 in., 216 in., 240 in.


## Ford Expanding Canadian Plant

In a new expansion of manufacturing facilities and in other construction projects in its main plant at Windsor, Ont., Ford Motor Co. of Canada, Ltd. is spending approximately \$1,175,000. The program includes remodeling of the former power-house building to house a new physical laboratory, a service experimental and service school

*Make a Mental Note  
of*


**DEPENDABLE *Dole* THERMOSTATS**

The Dole Line of Automotive Thermostats includes models for motor block and hose line installation... both Poppet and Butterfly Types... with and without nipples for hot water heater connection. All models assure reliable automatic control of engine temperature under varying road, load, and weather conditions... are proof against leak, seepage and wear.




**DEPENDABLE THERMOSTATIC BI-METAL**

Dole Thermostatic Bi-Metal... made to exacting specifications by time-tried procedures that assure complete uniformity of quality... can be purchased in (1) Sheets up to 14 inches wide; (2) Strips any width; (3) Coils, as long as 1,000 feet; (4) in diversified fabricated parts such as spiral or helical coils, hairpin or U-shapes, flat strips, etc.



**DEPENDABLE *Dole* FITTINGS and Special Parts**

Compression couplings for all tubing connections and a complete assortment of water line and hose parts for automobile hot water heaters... all built and factory tested to withstand severe vibration and strain. Also special brass parts from customer's blueprints... to his specifications.



**DOLE**

THE DOLE VALVE COMPANY  
1901-1941 CARROLL AVENUE CHICAGO, ILLINOIS  
DETROIT OFFICE: 2-137 GENERAL MOTORS BLDG.

**THERMOSTATS**

## 1,000,000-Mile Test

The Atlantic Refining Co. is subjecting a new, improved gasoline to a performance test in Florida under actual road and service conditions. Each of a fleet of low-priced stock cars, fueled with the new gasoline, is being driven 1000 miles each 24 hours, seven days a week, over a 171-mile test course running from the outskirts of West Palm Beach to a point a few miles north of Okeechobee, and return. A corps of ordinary drivers, working in eight-hour shifts, keeps the fleet rolling to average a course speed of 50 m.p.h. It is planned to drive each of the fleet cars approximately 100,000 miles—equivalent to 10 years of average driving. The total mileage piled up by the fleet is expected to be well in excess of 1,000,000 miles.

department and a new employment office; a modern plant hospital; new equipment in the foundry and machine shop; completion of the program to modernize the power plant, and miscellaneous new equipment and improvements throughout the plant.

## Waukesha Reports 30% Improvement

Earnings of Waukesha Motor Co., Waukesha, Wis., for the first half of the present fiscal year, ending Jan. 31, 1940, amounted to \$141,114, representing an improvement of approximately 30 per cent over a similar period for the fiscal year 1939. Directors voted the regular quarterly dividend of 25 cents a share on stock of record March 15, payable April 1.

## Metal Markets

(Continued from page 338)

having at times last week sold at as high as 49 cents a pound, spot Straits tin was freely offered at 46½ cents on the first two business days of the week ended March 23. Latest statistics, made public by the New York Commodity Exchange, tend to encourage those who believe that easier market conditions are in the offing, but there is so much uncertainty regarding the future that all conservative buyers can do is to take advantage of offerings when the market looks fairly easy, so that they may avoid too sharp upward fluctuations, when they do come.—W. C. H.

## Elastic Stop Nut Corp. Building New Factory

Elastic Stop Nut Corp., Elizabeth, N. J., recently broke ground for a new plant at Union, N. J., suburb of Newark. The plant will be used solely for

the manufacture of the corporation's extensive line of self-locking nuts. Transfer from the present plant will be made about June first. The Austin Co., of Cleveland, is the general contractor.

## John H. Sullivan

John H. Sullivan, 68, president of the Sullivan-Becker Machine Co., Kenosha, Wis., and a pioneer automotive engineer, responsible for many innovations in the machine tool industry, died at a Kenosha hospital March 4 following a long illness.

## L. C. Block

Louis C. Block, 60, pioneer in the automobile field and president for nine terms of the Philadelphia Automobile Trade Association, died March 9 at his home in Elkins Park, Pa. Mr. Block gave up a career as a long-distance bicycle racer in 1905 to become advertising manager of *Automobile Topics* and two years later joined the Ford Motor Co. as their first traveling field representative.

During the World War, Mr. Block was in charge of the Ford plant in Philadelphia where steel helmets used by the American forces were produced.



# How to Save Money on Steel

● Reduced shop labor costs . . . Elimination of heat treating failures, costly testing and re-treating . . . less clerical expense—these are money-saving advantages regularly reported by manufacturers who standardize on Ryerson Certified Steels. These uniform high quality steels are made to close range specifications. They are free from hard or soft spots and can be depended on for uniform working and forming qualities.

A special quality control plan on Alloy Steels assures uniform heat treatment response. Entire heats are selected and complete chemical and physical properties, and exact heat treating characteristics are sent with every order to guide the heat treater in securing dependable, uniform results. He does not have to test. He takes no chances. Spoilage and re-treating are eliminated and a sound, dependable job is assured.

Ryerson Certified Steels stocks are complete and diversified. You can save time, trouble and money by concentrating all steel requirements with this one dependable source of supply. Everything from the heaviest structural to the smallest rivet—from mechanical tubing to welding rod is carried for Immediate Shipment. If you do not have the current Ryerson Stock List we will gladly send a copy. Joseph T. Ryerson & Son, Inc. Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.



# RYERSON



## MEN . . . . .

**David T. Marvel**, formerly manager tube sales, Timken Steel and Tube Division of Timken Roller Bearing Co., Canton, Ohio, has joined National Tube Company's sales organization in the capacity of assistant manager of sales, Ellwood Sales Division, Ellwood City, Pa.

**C. N. Kirkpatrick** has been elected vice-president and general manager of the Landis Machine Co., Inc., Waynes-

boro, Pa. Mr. Kirkpatrick was formerly vice-president in charge of sales and also secretary of the company. **J. H. Elliott**, purchasing agent of the company, has been elected secretary and will continue also as purchasing agent.

**Dr. Charles F. Kettering**, president of the General Motors Research Council, has been invited by Secretary of Commerce **Harry L. Hopkins** to take the general chairmanship of the executive committee and membership on the general commission established to formulate plans for a celebration commemorating the 150th anniversary of the United States patent system. A Con-

gressional resolution set up a commission to celebrate April 10 as Inventors and Patent day.

**F. L. LaQue**, of the Development and Research Division of the International Nickel Co., Inc., delivered the annual lecture before the Toronto Chemical Association, sponsored by the Ontario Research Foundation, on March 19. Mr. LaQue's subject was "Corrosion and Corrosion Processes."

**John V. Shea** has been appointed general purchasing agent for the Indian Motorcycle Co., Springfield, Mass. Announcement of the new appointment was made by **Dwight L. Moody**, newly elected vice-president and general manager of the company.

**Robert S. Crawford** has been named superintendent of rolls for the Timken Roller Bearing Co., Canton, Ohio. Mr. Crawford will assist **Gene Ball**, superintendent of rolling mills. **Jay Irwin** has been appointed Chicago district manager of the Steel and Tube division of the same company.

**Foster N. Perry** has been appointed general sales manager of the American Bosch Corp., Springfield, Mass., with headquarters in Springfield. **A. C. Altree** succeeds Mr. Perry as sales manager of the Western division, and **Frank Oberle** is being transferred from New York to become sales manager of the Cleveland division. Additional changes in the sales organization include the appointment of **Fred Behrens** to the position of service manager with headquarters at Springfield, and **George H. Cherry** to the new position of sales manager of the Canadian division.

**Ernest N. Robinson** has been appointed to the newly created position of assistant sales manager of the accessory division, Stewart Warner Corp.

**James T. Pardee**, chairman of the board and vice-president of The Dow Chemical Co., was honored March 14 by the Case School of Applied Science, Cleveland, with the degree of doctor of commercial science.

**Edwin Hall**, formerly with the Delco Products division of General Motors Corp. and the Chrysler Corp., has joined the Harris Products Co., as sales engineer.

**H. D. Tompkins** has been appointed sales manager of the Firestone Tire & Rubber Co. with headquarters at Akron, Ohio. **C. M. Barnes** has been named to succeed Mr. Tompkins as sales manager of the Firestone Co. of California.

**Clyde G. Riley**, manager of the Los Angeles zone for Pontiac, has been shifted to Chicago in a similar capacity, succeeding **W. J. Mougey**, recently appointed Pontiac advertising manager. **A. M. Sanders**, zone manager at San Francisco, has taken over the Los Angeles post, while **John S. Bathrick** goes from Portland, Ore., to San Francisco. **Charles C. Currie**, assistant zone manager at Cincinnati, takes over Bathrick's former position.

# PRECISION maintained!





part goes the metered oil-film it individually needs. Automatically! For a day's bigger output of higher quality work . . . for savings on maintenance . . . standardize on BIJUR.

BIJUR LUBRICATING CORPORATION, Long Island City, New York

"MONARCH" LATHE—Metered feed to ways, cross slide, apron bearings . . .

- High standards of machine accuracy, versatility and speed become of maximum value only when they are **MAINTAINED**. Bijur-lubricated machines are protected for life! Bearings, slides, gears . . . to each Bijur-fed

# BIJUR

AUTOMATICALLY *Correct* LUBRICATION



The correct  
oil film  
to each  
individual  
bearing...  
*automatically*



**Henry Lowe Brownback**, consulting engineer, Norristown, Pa., has been elected to the council of the (French) Society of Automotive Engineers.

**W. L. Kelly**, former vice-president and county sales manager, has severed his connection with Chicago Molded Products Corp. and retired from active business. He intends after a short vacation to devote his time to private interests. **E. C. Maywald**, executive vice-president of the company, will continue in charge of all sales activities.

**North A. Wright** has been named general sales promotion manager of Libbey-Owens-Ford Glass Co. Mr. Wright, for several years the company's advertising manager, will head a new division designed to consolidate and increase various sales promotion activities. For the same company, **Carlton K. Matson**, director of public relations, will assume direction of the Libbey-Owens-Ford advertising department in addition to his other duties. **Karl F. Radke** will continue as assistant advertising manager and **Earl Aiken** in charge of product publicity.

**James W. Corey**, since 1932 general sales manager of The Reliance Electric & Engineering Co., Cleveland, has been elected sales vice-president. Officers re-elected are: **Clarence L. Collins**, president; **H. Morley Hitchcock**, vice-president and treasurer; **A. M. MacCutcheon**, engineering vice-president; **C. V. Putnam**, secretary; and **H. F. Walters**, assistant treasurer.

**Paul R. Mattix** has been appointed chief of the Automotive-Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce. Mr. Mattix succeeds Irving H. Taylor who resigned to enter private business.

## BOOKS.....

**THE MATHEMATICAL THEORY OF NON-UNIFORM GASES**, by *Sidney Chapman, M.A., D. Sc., F.R.S. and T. G. Cowling, M.A., D. Phil.* Published by Cambridge University Press, The MacMillan Co., New York

This book is addressed principally to mathematicians and theoretical physicists, but it is intended also to serve the needs of laboratory workers in chemistry and physics, and to this end the authors have collected the chief formula derived from theory and discuss them in relation to available experimental data.

An account is given of the mathematical theory of gaseous viscosity, thermal conduction, and diffusion. The methods originated by Enskog are chosen for the presentation of the subject, but are improved upon. Later chapters describe more recent work, on

dense gases, on the quantum theory of collisions, and on the theory of conduction and diffusion in ionized gases in the presence of electric and magnetic fields. A brief historical summary of the development of the mathematical theory is given at the end of the book.

## Ohio State Offers Course In Welding Engineering

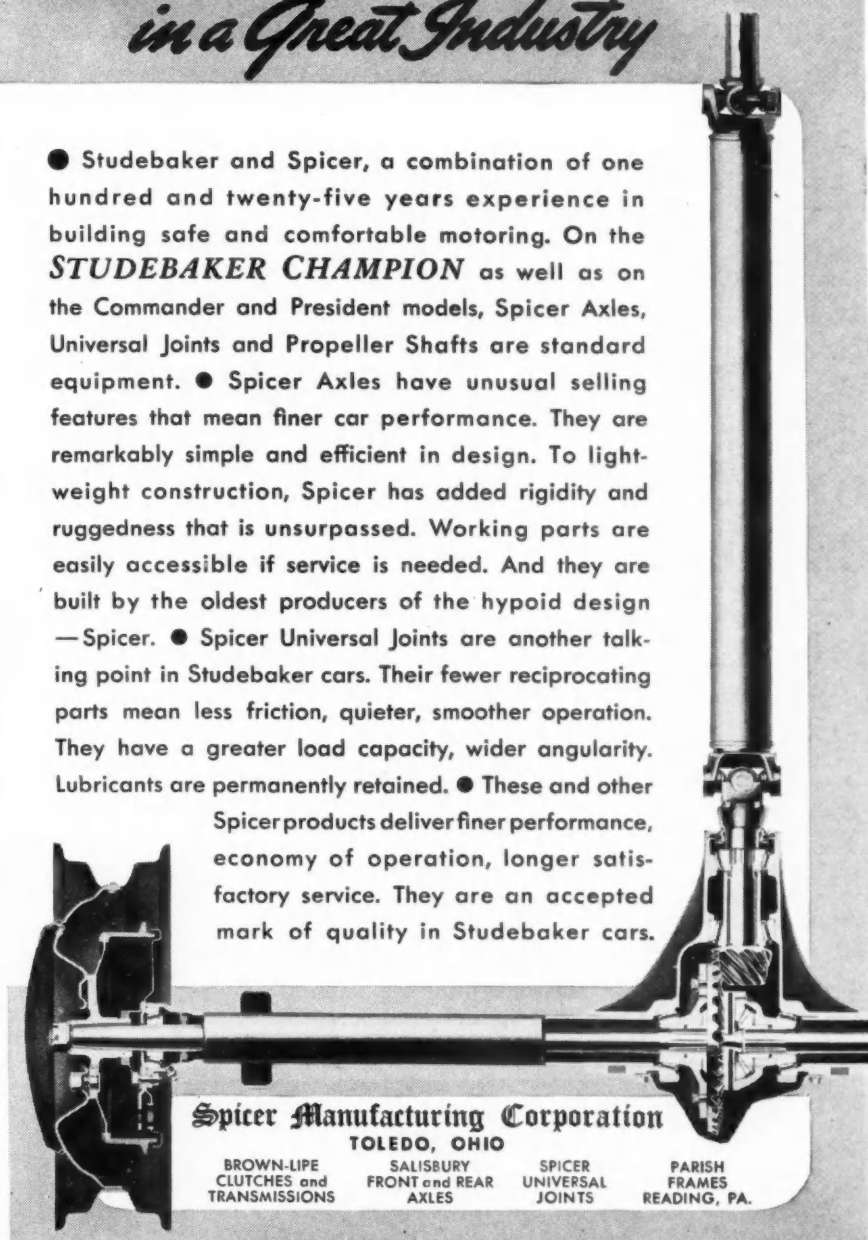
The Welding Division of Ohio State University's Industrial Engineering Department is offering a special short course in welding engineering which

has been scheduled for April 16, 17 and 18. During these three days, three classes will be held daily on subjects, such as welded joints, fundamental mechanics, welding symbols, production welding, etc. Lectures will be given by prominent engineers in the welding field, as well as by members of the university staff.

This course will be given in place of the Annual Welding Conference which has been held on the campus each year since 1931. Further information may be obtained from J. R. Stitt, assistant professor, Welding Engineering, Ohio State University, Columbus, Ohio.

# Two Old Names in a Great Industry

● Studebaker and Spicer, a combination of one hundred and twenty-five years experience in building safe and comfortable motoring. On the **STUDEBAKER CHAMPION** as well as on the Commander and President models, Spicer Axles, Universal Joints and Propeller Shafts are standard equipment. ● Spicer Axles have unusual selling features that mean finer car performance. They are remarkably simple and efficient in design. To lightweight construction, Spicer has added rigidity and ruggedness that is unsurpassed. Working parts are easily accessible if service is needed. And they are built by the oldest producers of the hypoid design — Spicer. ● Spicer Universal Joints are another talking point in Studebaker cars. Their fewer reciprocating parts mean less friction, quieter, smoother operation. They have a greater load capacity, wider angularity. Lubricants are permanently retained. ● These and other Spicer products deliver finer performance, economy of operation, longer satisfactory service. They are an accepted mark of quality in Studebaker cars.



**Spicer Manufacturing Corporation**  
TOLEDO, OHIO

BROWN-LIFE  
CLUTCHES and  
TRANSMISSIONS

SALISBURY  
FRONT and REAR  
AXLES

SPICER  
UNIVERSAL  
JOINTS

PARISH  
FRAMES  
READING, PA.

## Hearing

(Continued from page 337)

Bishop closed his remarks with the request that the proposed rules be not promulgated for the reasons: (1) that they fail to deal effectively with the basic manufacturer-dealer problems; (2) that insofar as they purport to correct unfair competitive practices between dealers are wholly inadequate, as the condemned practices principally occur in intrastate commerce and thus could not be enforced against offenders; (3) the rules designed for the protection of the consuming public, while

recognized to be of merit, are generally unenforceable by a federal agency by reason for their occurrence in intrastate commerce in local transactions, and unenforceable by voluntary agreement by reason of severe competition.

The Automobile Manufacturers Association went on record as being "sympathetic" with the purpose of the proposed FTC rules but suggested further study particularly of those rules to which the application of the law might be uncertain. The manufacturers' position was set forth in a communication to the commission and was not personally represented at the hearing.

In a letter written by Pyke Johnson,

AMA executive vice-president, the association did not specify which rules need clarification, but said that some of the provisions go beyond a mere restatement of ordinary principles of business honesty. In these instances, the letter added, the language used means that "their application might lead to such uncertainty of interpretation as to defeat their purpose and adversely affect the industry and its customers."

The AMA, which did not sponsor the rules and at no time asked to be covered by them, reiterated a statement made in 1938 that "if the simplified restatements of law which your rules effect can help the marketing branches of our industry to better methods of competition, we shall all be benefited."

After citing its own policies of favoring keen competition reflecting low prices for cars, the organization endorsed the purpose of the new rules insofar as they "express existing law and promote these ends."

## MEMA Index Up to 178 in January

According to manufacturers reporting their business figures to the Motor and Equipment Manufacturers Association, January shipments increased over the previous month in all categories except accessories. With the same exception they are above MEMA indices for the same month last year.

The grand index for all branches of the industry in January rose to 178 per cent of the January, 1925, base as compared with 143 per cent for December and 148 per cent for January, 1939. Shipments to vehicle manufacturers for original equipment in January advanced to 201 per cent of the base, which compares with 177 per cent registered in December and 160 per cent for January last year.

Service parts shipments to wholesalers for January increased to 141 per cent of the base as compared to 127 per cent in December. In January, 1939, the index stood at 129 per cent. Accessories shipments to wholesalers in January dropped, standing at 91 per cent of the base index, which compares with 101 per cent in December and 131 per cent in January, 1939. Service equipment shipments to wholesalers in January rose to 104 per cent of the base, which compares with 87 per cent in December and 91 per cent in January, 1939.

## 40 YEARS AGO

We understand from Gilbert & Barker, 82 John St. (New York City), that numerous stations are being located at various points in the city and suburbs for the sale of gasoline to motor vehicle owners. They supply the gasoline only in bulk to these stations, which in turn retail it to the consumer. From *The Horseless Age*, April, 1900.



## ONLY LAPPING As Strom Does It CAN PRODUCE SUCH PRECISION

Strom Steel Balls possess a degree of surface smoothness and sphericity that has never been equalled in any other regular grade of ball. Such precision is exclusive with Strom because it can be attained only through a series of lapping operations such as are standard practice in the Strom plant.

Physical soundness, correct hardness, size accuracy and sphericity are guaranteed in all Strom Balls.

Other types of balls—*stainless steel, monel, brass and bronze*, are also available in all standard sizes.

Write for complete details.

**Strom** STEEL BALL CO.

1850 So. 54th Avenue, Cicero, Ill.

*The largest independent and exclusive Metal Ball Manufacturer*

## MEN and MACHINES

(Continued from page 331)

It is designed to speed up the operation of straightening round shafts that are either turned or ground. The shaft, when placed on the straightening block, is suspended between two sets of hardened rolls. In this position the operator can spin the shaft to locate the high spots either with a piece of chalk or a dial gage. Then, without removing the work from the blocks, pressure of the arbor press is applied to the work. This pressure causes the rolls to recede or give way, being mounted on swinging arms, and the work falls between two steel vees for straightening. When the pressure is released from the work, the springs mounted in the block will lift the rolls and work away from the vees to a stop which is provided to centralize the rolls. Then the

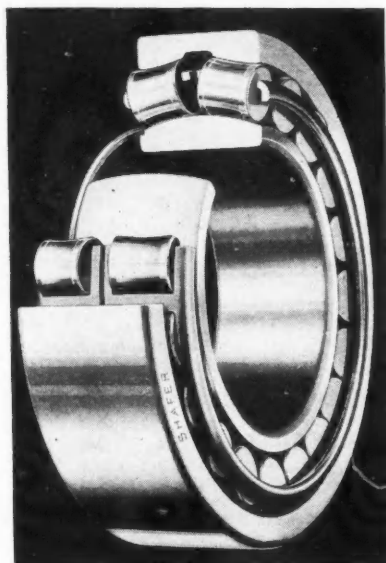
**T**HE following paragraphs briefly describe new offerings of machine tools and allied products which have been brought to the attention of *Men and Machines* within the past month:

Diminutive size precision ball bearings down to  $\frac{1}{8}$  in. in bore which heretofore have been available in the "full" (retainerless) type can now be

obtained as standard with retainers (or ball cages). A new data sheet covering these small bearings is available. *Norma-Hoffman Bearings Corp., Stamford, Conn.*

Sterling Gyro electric sander suitable for use on wood, metal or other surfaces. It weighs  $3\frac{1}{2}$  lb. and uses one-quarter of a standard 9 by 11-in. sheet of abrasive paper. Universal electric motor operates at 4000 r.p.m. *Sterling Products Co., Detroit.*

A new live center with interchangeable inserts or center pieces for holding centered and uncentered work. Three inserts are available and may be used interchangeably depending upon



Shafer "DE" series self-contained double row roller bearing.

work is ready for the second test. In other words, the complete straightening operation can be accomplished without moving the work from the combination blocks. Blocks are furnished in the following sizes: No. 2 for shafts from  $\frac{1}{2}$  in. to 1 in. in diameter; No. 3 for shafts from 1 to 2 in. in diameter; No. 4 for shafts from 2 to 3 in. in diameter.

The Greenerd company also recently brought out a new six-ton completely self-contained hydraulic press which completes the manufacturers' range of hydraulic presses from  $1\frac{1}{2}$  tons to 15 tons capacity.



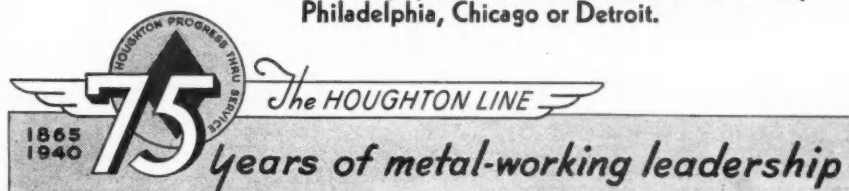
## CUT-MAX

### INCREASES PROFIT... PRODUCTION

Is your cutting oil increasing your profits... or is it just "doing a job"? Remember, the coolant you use may easily decide between profit and loss... success or failure!

CUT-MAX will help increase profits, by permitting greater production... fewer rejects... higher speeds... less frequent tool regrinds. Here's a case: 72.3% more pieces per grind when CUT-MAX was used; this meant longer tool life... greater production. Another case: tools had been reground every shift, but by changing to CUT-MAX tools lasted four shifts before regrinding.

More proof can be found in the folder describing CUT-MAX straight cutting oils and bases. For a copy, write E. F. HOUGHTON & CO., Philadelphia, Chicago or Detroit.





the work to be centered: 1. Male insert for work already centered. 2. Plain female insert for uncentered work. 3. Female insert with three raised lands for uncentered work having a flat or burred keyway. *Ideal Commutator Dresser Co., Sycamore, Ill.*

Two hard facing electrodes designated as "Faceweld No. 1" and "Faceweld No. 12." These electrodes are cast abrasion-resisting alloys used for hard-facing by the metallic arc process. "Faceweld No. 1" is a general purpose hardfacing electrode and is the softer and tougher of the two. "Faceweld No. 12" is somewhat hard-

er than "Faceweld No. 1" and has superior resistance to abrasion. *Lincoln Electric Co., Cleveland, Ohio.*

A complete line of propeller type air motor drive agitators for both open and closed type containers. *Binks Mfg. Co., Chicago.—H. E. B., Jr.*

### Publications Available

A descriptive bulletin concerning abrasive snagging wheels for foundry and billet grinding has been issued by the Abrasive Co., Philadelphia, Pa. It contains data about recent improvements in the abrasive line and includes latest standard recommendation tables for vitrified and resinoid-

bonded wheels for floor stand, swing frame and portable grinders.\*

A new brochure describes in pictorial form the methods used by the Pyott Foundry & Machine Co., Chicago, in manufacturing round castings.\*

Mixing Equipment Co., Inc., Rochester, N. Y., has brought out a pamphlet covering its line of "Lightnin" propeller type agitators.\*

The H & H Research Co., Detroit, has prepared a catalog on its multi-purpose tool and accessories. The lightweight hand device operates with a reciprocating movement and accommodates six different types of accessory tools (honing stones, files, chippers for steel, chippers for wood, wood gouge, sander and saws).\*

A 52-page booklet, entitled "For Better Gears," has been released by the Michigan Tool Co., Detroit. The booklet contains a number of articles on factors affecting gear production, including "Gear Finishing", "Curve Shaving", "Lapping Hints", and "Locating Gear Troubles", in addition to descriptions and specifications of the complete line of Michigan gear production equipment.\*

The Jones & Lamson Machine Co., Springfield, Vt., has issued a new turret lathe tool catalog. This book is divided into three sections, the first containing photographs and general descriptions of J&L universal turret lathe tools, the second, dimensional diagrams and tool numbers for the various machines, and the third is a section devoted to tools for flat turret lathes.\*

The line of products manufactured by the Chicago Belting Co., Chicago, is described in a new condensed catalog.\*

The Fulton Sylphon Co., Knoxville, Tenn., has issued a leaflet on its Sylphon seamless metal bellows for converting pressure effects into controlled movement, for making flexible sealed connections of moving parts, providing expansion chambers and similar services.\*

A handy wall chart, which illustrates a practical new type of chip breaker design for Kennametal steel-cutting carbide tools, has been issued by the McKenna Metals Co., Latrobe, Pa.\*

A new booklet, "Sheet Metal Welding Fundamentals", has been published by the Linde Air Products Co., a Unit of Union Carbide & Carbon Corp., New York.\*

New grinding machines, manufactured by the Norton Co., Worcester, Mass., are the subject of a leaflet No. M-413, just issued.\*

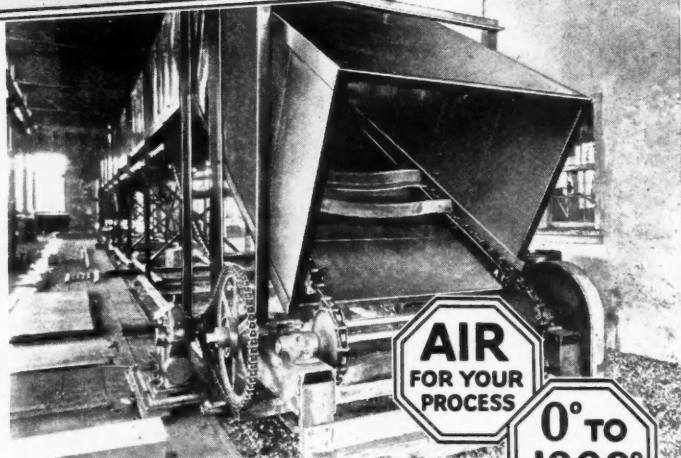
The improved No. 4 automatic hob sharpening machine, manufactured by the Barber-Colman Co., Rockford, Ill., is described in the company's bulletin No. F 1011-2.\*

An illustrated folder on Standard semi-automatic molding presses for use in the production of plastics moldings and mechanical rubber goods has been brought out by the F. J. Stokes Machine Co., sales representative for this line of equipment.\*

Equipment built by the Clearing Machine Corp., Chicago, and the International Machine Tool Co., Inc. (subsidiary), Indianapolis, Ind., is described in a new bulletin.\*

\*Obtainable through editorial department, AUTOMOTIVE INDUSTRIES, Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

## The Modern Method Of DRYING-BAKING



for the

## Automotive Industry

In every industry where metal must be processed on large production schedules, you find progressive plants benefiting by the use of

### ROSS OVENS and DRYERS

with oil or gas fired heating

In the three essential factors of Oven Construction, Method of Heating and Material Handling, Ross designed systems provide exceptional advantages. On a wide variety of automotive parts, Ross systems are providing cleaner products, more uniform temperatures and shorter baking or drying time.

Use our 20 years of experience to analyze your requirements; to assure correct oven construction, most economical fuel, a better product. No obligation.

Conveyor  
Dryers

Tower  
Dryers

Batch Type  
Ovens

Continuous  
Ovens

Tunnel  
Ovens

## J. O. ROSS ENGINEERING CORPORATION

Main Office — 350 MADISON AVE., New York, N. Y.

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12353 Greeley Ave.  
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ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

# "YES, ANOTHER FIFTY MILLION MILES WITH JENKINS VALVES"

says the Service  
Manager of Cleveland's  
Yellow Cab Fleet

Not one valve replacement  
in all this mileage

Tire servicing simplified

Capless feature a great time  
saver on pressure checking

Flexible stem protected  
many tubes and casings

No valve insides, or caps  
to replace—a real saving in  
money and labor

Leakproof construction has  
increased tire life

Definite contribution to  
safe, carefree motoring



JENKINS BROS., BRIDGEPORT, CONN.

## Yellow Cab Company

Office: 2020 West Third Street  
CLEVELAND, OHIO

Jenkins Bros.  
Akron, Ohio

Att: Mr. Wm. J. Frisby, Sales Mgr.

Dear Mr. Frisby:

Yes - during 1939 we have run another FIFTY MILLION tire miles on Jenkins Capless Valves, and we have yet to replace a single valve.

I have been 18 years in tire service work, and since we started using Jenkins Valves 3 years ago, I can honestly say that our tire servicing has been greatly simplified and our valve problems are a thing of the past. The capless feature is a great time saver, on pressure checking.

In cases of puncture, the flexible stem of the Jenkins Capless Valve has saved many inner tubes and casings for us. Operating the number of caps we do (375 in all), the elimination of valve cores and caps represents a real savings - both in the outlay of money to buy these parts and in the labor involved in putting them on. The leakproof construction, holding the proper pressure at all times, has increased our tire mileage.

Jenkins has certainly shown the industry that a Leak-Proof Capless Valve is possible and I venture to predict that in the near future, caps and cores will be as scarce as hand cranks.

Your modern valve is a definite contribution to safe and care-free motoring.

Very truly yours,

*R.R. Gray*  
R.R. Gray Service Mgr.  
CLEVELAND YELLOW CAB CO.

# JENKINS FLEXIBLE CAPLESS TIRE VALVE

"GUARANTEED FOR THE LIFE OF THE TUBE"

## Twin Disc Products Held To Rigid Specifications

(Continued from page 319)

point is an improvement in operating ease which has lessened fatigue to a marked degree.

Twin-Disc is particularly proud of a new Kearney & Trecker milling machine designed and tooled specifically for producing extremely accurate and straight keyways so essential to the alinement of various types of equipment made by this company. Principal feature of the milling machine is the

rugged and massive work-holding fixture which, in combination with the heavy-duty machine design, makes it possible to mill keyways without vibration and chatter.

The fixture was designed primarily to effect the maximum of flexibility, in handling a wide variety of keyways, in many different ranges of shaft size, diameter, location of keyseats, etc. The keyseats also vary in character from straight, tapered, and Woodruff, to some with blind ends.

Essentially, the fixture consists of a base constructed in three sections, bolted to the milling machine table

proper. Attached and pivoted to the center section is the holding fixture proper, machined and constructed so that it is carried between the two shoulders of the end sections. These end sections are provided with heavy clamping bolts so as to secure the holding fixture rigidly in position after it has been adjusted to the proper angle.

Clamping of the work is accomplished with slip clamps. These are slipped under studs placed at strategic points so as to miss the workpiece. On short shafts, only one clamp is used. On long shafts, generally, two clamps are used.

In milling Woodruff keyseats or keyseats with the blind ends, after the shafts have been clamped in the fixture, the adjusting mechanism at the right-hand end is used so as to manually tilt the table to the proper angle. With long blind keyseats, the table feed is engaged. With Woodruff keyseats, it is only necessary to sink the shafts to the proper depth, then drop it away from the cutters.

## The Industry's Issues

(Continued from page 308)

without the consent of Congress, lay any Duty of Tonnage. . . ."

In an eloquent brochure titled "Highway Barriers," the American Trucking Associations, Inc., points out that state lines have become points in space to railroads, airlines and water commerce pursuing its lawful course and service. But to the motor carrier, a state line "generally spells trouble, red tape, taxes and delay."

In some states, these forms of obstruction have been coagulated into "ports of entry" which wilfully parallel the powers reserved to the Federal Government, and forbid the entry into the state of any truck which does not pass through designated points for designated inspections. Trucks which get through are given clearance papers, like those of a ship clearing Federal Customs and Quarantine. Truck drivers who pass through this routine habitually, refer to each other ironically as "captain" and to helpers as "first mates."

So flagrant have such barriers to interstate commerce become, that a committee representing a number of Federal agencies is studying the problem and attempting to find a remedy. Another group, the Temporary National Economic Committee is listening to testimony on the subject as this is being written. The American Trucking Associations, Inc., is planning to undertake the most ambitious public relations program in its history to re-educate the public on the utility of trucks. The problem of interstate commercial barriers, and particularly those which affect truck traffic will probably yield to protracted study and action. Action will be expedited if you learn more about the problem yourself. Fifteen minutes of study in "Highway Barriers" will give you a good start.



**LET'S SHARPEN OUR PENCILS**  
to figure the cost of  
**SPRINGS!**

**L**ET'S get to the heart of this subject of spring costs and see how Accurate Springs can save you money in the long run. Sharpen your pencil and put these items down:

- 1. First Cost**—The Accurate plant is set up in such a manner that the cost of precision production and close inspection of even the most complicated and special springs is held to a minimum—you profit because of this.
- 2. Assembly Time Cost**—Accurate Springs are accurate—they'll clear your inspection department quickly and pass on to the production lines without costly delay, without holding up assembling operations.
- 3. Delayed Delivery Costs**—When your production is geared to meet your own delivery dates, it costs you money if you don't get needed parts on time. Accurate acknowledges and gives you shipping dates on rush orders so that you can plan your production accordingly.

Don't forget to figure all of these hidden items when you figure the cost of springs. Then you'll see why Accurate quality and service bring you savings in the long run. Write for information today.

**Accurate Springs**

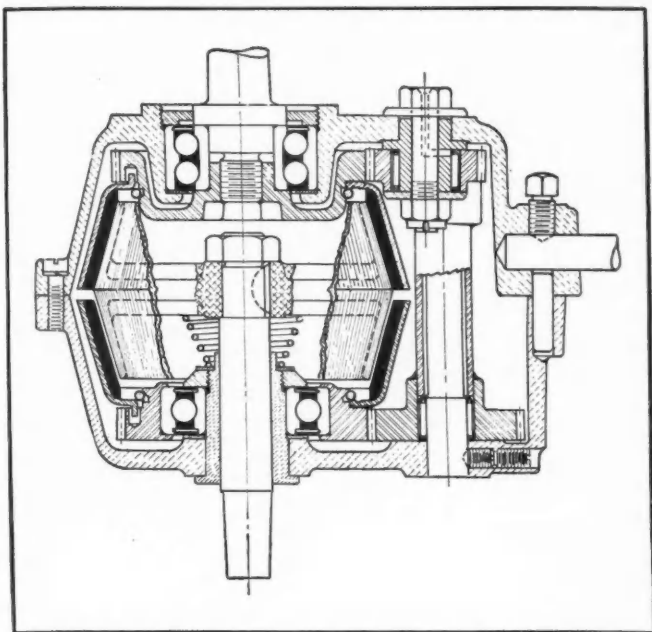
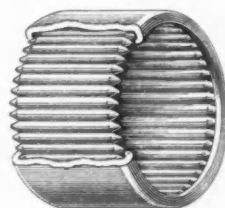
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**FREE HANDBOOK**  
Write today for your copy of Accurate's useful handbook of otherwise hard-to-find spring data. It's compact and informative.



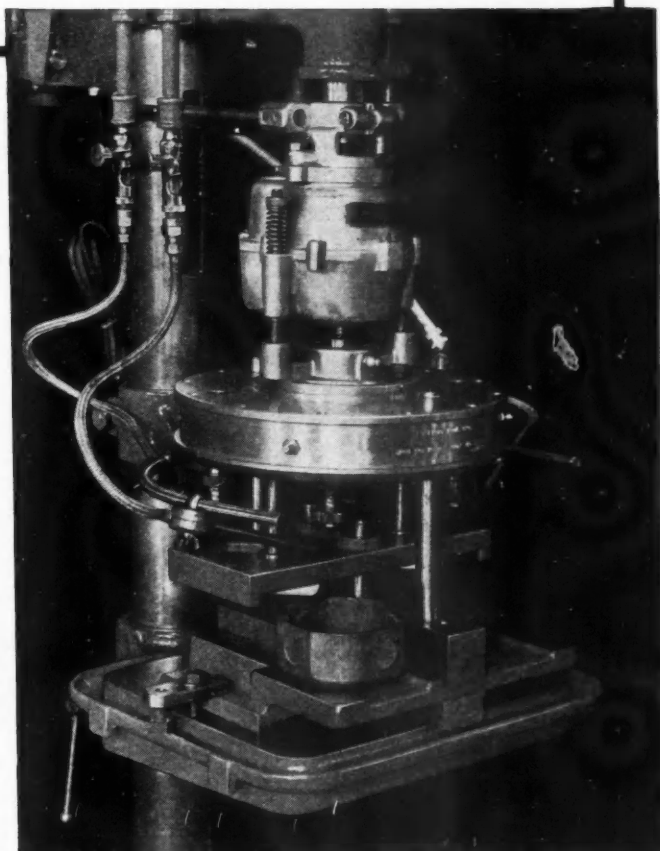
## "TORRINGTON NEEDLE BEARINGS

*Run for Weeks with only Occasional Oiling"*



(Above) View shows the Torrington Needle Bearings on idler gear and quill gear shaft in the Ettco Tapper, and single row Torrington Ball Bearing on clutch gears.

(Right) In the Ettco 1-B Tapper, reversing clutches impose heavy intermittent loads on the Torrington Needle Bearings. Torrington Ball Bearings are also used in this unit.



**B**ETTER LUBRICATION with little service attention is the outstanding advantage that Ettco Tool Co., Inc., gives its customers by using Torrington Needle Bearings on idler gear and quill gear shaft in its 1-B Tapper.

In this application the Needle Bearings are subjected to heavy additional intermittent loads as the reversing clutches operate. "Bronze bushings formerly used were difficult to keep properly lubricated," say Ettco engineers. "Now we have no trouble, as the equipment can run for weeks with only occasional oiling."

"In the four years since we adopted the Needle Bearing, we have had a remarkable performance record. We are getting excellent results, and intend to use more of these bearings in other equipment of our manufacture."

You too can incorporate these advantages in your product—and you can do it at surprisingly little cost. The Torrington Needle Bearing is inexpensive to buy—easy to install. Existing designs can readily be adapted to use the Needle Bearing. It can be mounted in the simplest type of housing—takes up no more space than a plain bushing—yet has exceptionally high radial load capacity.

The Torrington Engineering Department will gladly work with you in laying

out applications for the Needle Bearing in your products. For further information, write for Catalog No. 7. For Needle Bearings to be used in heavier service, request Booklet No. 103X from our associate, Bantam Bearings Corporation, South Bend, Indiana.

*The Torrington Company*  
ESTABLISHED 1866  
*Torrington, Conn., U.S.A.*

Makers of Needle and Ball Bearings

New York Boston Philadelphia Detroit  
Cleveland Chicago London, England

# TORRINGTON NEEDLE BEARING

## Performance Test is Only Adequate Gage

(Continued from page 334)

These joints are now welded, which has eliminated the trouble mentioned. The addition of an extra "band" on the armature has reduced the possibility of "throwing" windings.

Fire hazards are not entirely eliminated by the low volatility of the Diesel fuel, and to guard against fires, engine pans are eliminated, all units and places where oil might accumulate are thoroughly washed periodically, and the ex-

haust pipe is shielded. These practices, by the way, are required by the regulations of the licensing authorities.

Where the injection pump is driven by a chain, its timing should be checked periodically, as it is changed by "stretch" of the chain.

The principal trouble with pistons and cylinders arose from the fact that the top rings were too thin and narrow, with the result that they tended to

flutter and then would "peen" the piston, enlarging the groove excessively. In addition, trouble was caused by carbon building up behind the ring, causing it to seize and drag on the cylinder wall, in some cases so strongly that the crown of the piston pulled off. These troubles have been largely eliminated by cutting wider and deeper ring grooves and using correspondingly stiffer rings, and by flushing the cylinders with inhibitor as explained in the foregoing. Cylinder or liner wear has been greatly reduced by using liners of 500 Brinell hardness, instead of those of 240 Brinell supplied by the manufacturer. Oil cooling of the piston crowns entails many complications and, therefore, is of questionable advantage, in the opinion of the authors.

Crankcase ventilation should be adequate so that the greater part of the fumes from blow-by will be removed; but it should not be overdone, as an excessive amount of air passing through the crankcase would promote oxidation and sludging of the oil.

Heretofore, if the timing of injection was not fixed, it was controlled positively by the throttle setting, which may or may not be correct, as the proper timing depends on the engine speed. Recently an automatic centrifugal timer has been developed by one manufacturer, which advances the beginning of injection 11 crankshaft deg. from idling up to 1000 r.p.m., and maintains it at a fixed advance of 31 deg. from 1000 r.p.m. to the maximum speed. This facilitates starting and renders the engine smoother while idling or accelerating.

Fuel pumps still give rise to certain difficulties, of which the following were experienced by the authors: (1) Service replacements are rendered difficult by inadequate interchangeability; (2) covers are weak and crack; (3) the fit of the plungers in the barrels is faulty, which allows fuel to leak into the pump-shaft housing; (4) moving parts of transfer pumps break and get between the cam and follower, wrecking the entire mechanism; (5) in some designs of pump, the throttle arm may come off and allow the engine to run away (while in other designs the throttle automatically returns to the idling position under such conditions); (6) governor springs break; (7) priming pump plungers fail to seat when in the "closed" position owing to incorrect length of shank, and then allow air leakage, causing the system to become "air-bound" and the engine to run irregularly and even to stall.

The authors say the transfer pump should not pump too much fuel, not only because that means unnecessary work by the pump, but also because it shortens the life of filter elements and makes it difficult to predict filter life, thereby increasing the chances of road failure.

External high-pressure fuel lines sometimes give trouble, and to reduce the chances of their failure, one manu-

## INFINITE CARE Produced the STEEL for this crankshaft

At first glance, there is nothing unusual about the crankshaft illustrated here. But if this piece of forged steel could speak, what a story it could tell!

It will be a story in keeping with Wisconsin Steel's high standards . . . of precision manufacture from raw material to finished product . . . of one rigid inspection after another . . . of carefully selected materials. The result is a finished product that stands up under the most exacting demands of the automotive industry.

Supplying the best automotive steels it is possible to produce is only one of the many services we render to industry. We are well equipped to make a wide variety of alloy and carbon steels. We invite you to write or phone us about your steel problems.



### WISCONSIN STEEL Products!

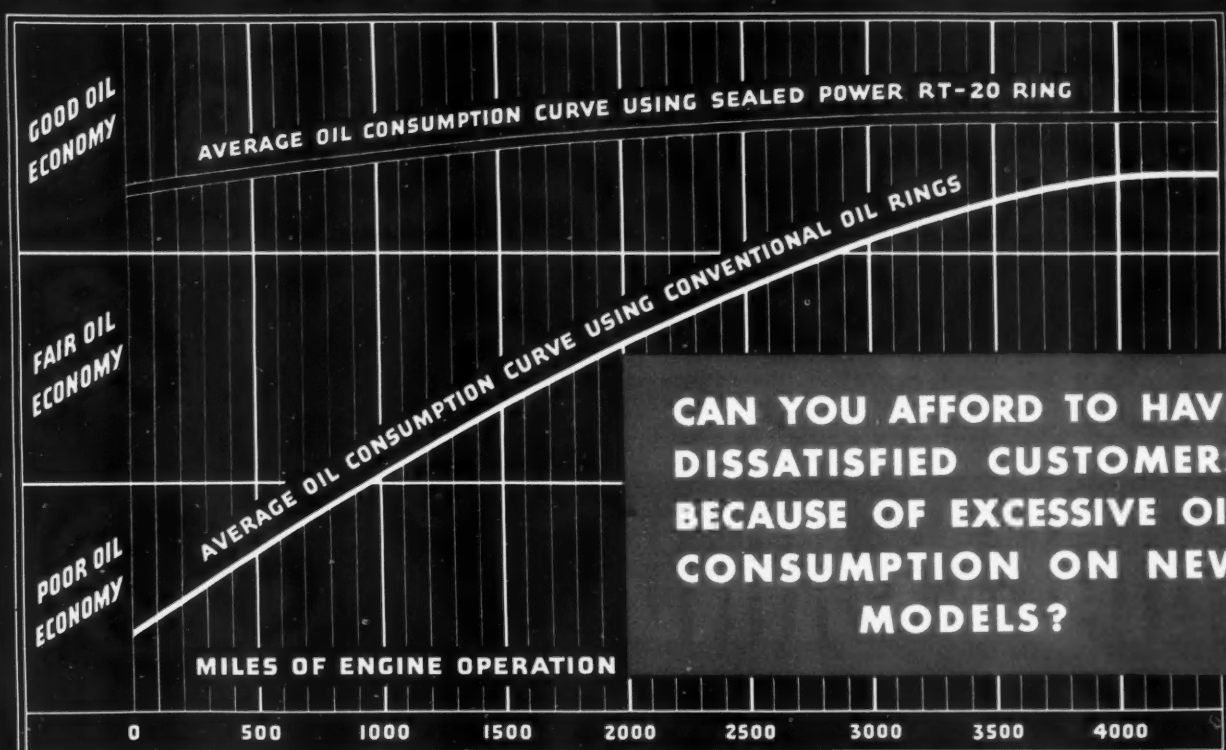
Open Hearth Alloy and Carbon Steel • Rounds, Flats, Squares, Bands, Skelp, Screw Steel • Agricultural and Special Shapes, Reinforcing Bars • Structural Angles, Beams, and Channels • Universal Plates • Cold Drawn and Turned Shafting • Billets, Blooms and Slabs • Pig Iron (Malleable, Foundry, Bessemer, and Basic)

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# WISCONSIN STEEL



**CAN YOU AFFORD TO HAVE  
DISSATISFIED CUSTOMERS  
BECAUSE OF EXCESSIVE OIL  
CONSUMPTION ON NEW  
MODELS?**

**A**UTOMOTIVE Engineers have created many improvements in engine design and production methods, resulting in greater efficiency over a longer period of operation. Improved methods for producing a fine and smooth finish on cylinder walls and reciprocating parts have been adopted. Engines are now thoroughly washed, removing every particle of dirt and abrasive produced by the various machining operations. Plus all these improvements, air and oil cleaners have been installed as a further precaution. All this means, less wear on the reciprocating parts during the "running-in" period.

The conventional piston rings, as now used, must be thoroughly "seated-in" before they reach their maximum efficiency. Because of the smooth surfaces and clean engines, these present rings take longer to "seat-in", resulting in poor oil economy when the engine is new. Often, 4,000 miles of operation are necessary before satisfactory oil economy is reached. New owners don't like this, for in many cases they have turned in an old job that required no additional oil between changes.

Sealed Power Engineers, recognizing this problem, set out to lick it—and have done so without affecting the long wearing qualities that are so essential.

Watch for further announcement on the new Sealed Power RT-20 Ring.

**WORTH WAITING  
FOR!**

**COMING  
SEALED  
POWER  
RT-20  
RING**



**SEALED POWER  
CORPORATION**

Muskegon, Mich. • Canadian Factory: Windsor, Ont.



facturer has developed a special ferrule and an anchorage clamp of synthetic rubber.

The pintle-type nozzle is more reliable than that with a number of very small radial spray orifices, as the danger of orifice becoming bridged over with carbon is greatly reduced. Nozzles must be very accurately fitted, as the slightest binding effect will cause the nozzle valve to stick and the nozzle to dribble; alternately, such binding may cause excessive pressures in the system, with consequent failure at some other point. In handling these delicate parts, the most meticulous cleanliness must be observed, as any dirt or grit, even in very small amounts, may cause ser-

ious trouble in operation after the parts have been assembled again.

Diesel engines preferably should be operated at a reasonably uniform temperature, for the reason that they are more efficient when hot and are very susceptible to "sludging" when cold. In services where conditions may change from periods of idling to periods of full power in a single run, and where atmospheric temperatures may range through 40 or 50 deg. in a single day, there is need for some external means for warming up the engine quickly and maintaining water-outlet temperatures between 180 and 195 deg. thereafter. This, the authors said, calls for a dependable thermostat controlling the

water circulation and the radiator shutters, the latter through power devices, and for a suitable inspection and service routine. Such equipment is available, but it needs further improvement. Surge tanks were recommended for the cooling system, to prevent loss of large amounts of water when the engine is suddenly shut down, and it was suggested that metallic joints in the cooling system be brazed rather than soldered, owing to the high temperatures which they may attain.

Fan spiders must be of ample strength to withstand rapid acceleration, as well as the added stress when the radiator shutters are opened or closed suddenly. In one Diesel engine of the corporation's fleet, in which pistons burned and seized, it was found that the rear cylinders, where the failure occurred, were not properly cooled.

While the paper in the main dealt with the shortcomings of the Diesel, the authors concluded on a rather optimistic note—that if the differences between the Diesel and the gasoline engine were recognized and proper allowances were made for them, there was no reason why the Diesel should not show a considerable advantage in fuel cost, a comparable maintenance cost, and suitable operating and performance characteristics. Where its high initial cost can be spread over a long period and high mileage, it should prove an entirely satisfactory investment, reduce the fire hazard, and overcome the exhaust-fume objection; in short, it should be "the engine of tomorrow" for an increasing number of uses.

### New Cummins Addition

A new laboratory and research building is rapidly being finished for Cummins Engine Co., at Columbus, Ind. This new structure will house five departments: metallurgical, chemical, engineering, record and supervision, machine and assembly, engine testing and development. The building itself will represent an estimated investment of over \$75,000. An additional \$125,000 will go for machinery for testing and building engines and parts.

A total of six engine test rooms are being built, all completely insulated and soundproofed. Ventilating fans will exhaust the air from each test room once a minute unless otherwise set.

Equipment will include six dynamometers, approximately seven precision lathes and many precision milling machines, drills, grinders, etc. Production accuracy will be checked with comparators and electro-limit gages, which provide accurate measurements up to .00000001 of an inch.

The metallurgical and chemical laboratory will employ some 16 units of instrumental equipment, including a universal tensile testing machine which tests up to 200,000-lb. capacities, and a microscope camera unit for the examination of steel specimens and engine parts with microscopic photographs enlarged as high as 825 diameters.



### SHOULD BE IN EVERY TOOL ROOM

Because they are designed and built to speed up precision grinding and finishing operations on dies, fixtures and other tools that must be accurately made.

Power—42 watts output—is delivered in abundance insuring continuous production without stalling. The high speed—24,000 R.P.M.—produces smooth finished cuts on all types of work. It is Streamlined, fits the hand and can be used continuously without overheating. Sufficient weight is provided to insure rigidity and perfect balance—yet the tool is light enough to be used all day without causing "hand fatigue."

Only the best materials we can buy are used in the manufacture of these Grinders, General Electric Motors, New Departure Precision Ball Bearings, machined rabbet fit alloy metal housings, patented chuck lock, and many other features. Approved by Underwriters Laboratories.

Send for the Duro Grinder Bulletin giving detailed information of their advantages and applications.

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